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USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT

SPECIAL NOTICE INSIDE

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USSR REPORT

Machine Tools and Metalworking Equipment

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STRONGER ROLE, GOALS OF MACHINE BUILDING ANALYZED

Moscow STANDARTY I KACHESTVO in Russian No 10, Oct 86 p 3-6

[Article by B. N. Sokolov, first deputy chairman of Gosstandart and doctor of technical sciences: "Quality -- An Acceleration Factor: Machine Building is the Vanguard of Restructuring"]

[Text] "It is time to put machine building at the forefront of economic, scientific, technological and psychological restructuring. The nation will not be able to assure fulfillment of planned goals unless there is a deep qualitative change in machine building." Those were the words of the 8 August 1986 CPSU Central Committee meeting on questions of a fundamental increase in the technological level, quality and competitiveness of machinery and equipment.

The assignment facing machine builders is one of pushing the limits of basic products to the highest world standard within 6-7 years. As also stated at that same meeting: "The task is revolutionary and unprecedented in practice. This assignment naturally requires revolutionary approaches for its solution."

What this means in practical terms is a fundamental restructuring of machine building and an increase in the technological level of machines, equipment and tools during the course of a single five-year plan (where previously not less than 3 to 4 five-year plans were required).

All this requires an increase in the technological level, quality and, especially, the reliability of computer equipment, as well as the widespread introduction of electronics and the latest means of communication and data transmission. There must be a sharp reduction in the amount of non-productive work which blocks specialists, designers and production engineers from creative work. There must also be a change in the approach to developing a prototype experimentation base through widespread automation of design and process development work.

The entire process of creating new equipment must be shortened severalfold.

In all phases of building the economics of socialism the Communist Party has expended a great deal of effort on problems of product quality. The first major effort was made in 1931 by V. V. Kuybyshev in a presentation at the 1st All-Union Conference on Product Quality. The party's call at the time was supported

by all the people and the result was that pre-war, and especially wartime, equipment production was characterized by particularly high quality and reliability.

Everyone remembers the pre-war long distance flights which proved the high quality of our aviation technology. Also remembered is the glory of our arsenal--the Degtyarev machine guns, medium and heavy tanks, etc. Our weapons were the best in the world and were made so by standardization achieved through the introduction of interchangeability standards which made the equipment very durable.

The problem of quality quickly became acute at the present stage of scientific and technical progress and development of the national economy. By decisions of the 27th CPSU Congress and plenary sessions of the party central committee, it was placed at the forefront of the national economy's restructuring and was raised to the rank of a national issue. However, it must be said that, in spite of recent economic measures aimed at stimulating an increase in product quality and the introduction of new product certification procedures, there have been no notable steps toward improving the quality of many types of machines.

The May 1986 resolution of the CPSU Central Committee and the USSR Council of Ministers, entitled "Measures to Fundamentally Increase Product Quality", is aimed at overcoming the negative effects of unsatisfactory design work, worker neglect of products, low engineering discipline, poor work by industrial monitoring agencies and inadequate standards.

This resolution begins a new era in the development of state control over product quality.

First, the problem of quality is examined within the full spectrum of problems which must be solved before a breakthrough can be made in this area. Second, the resolution raises the significance of quality indicators in monitoring the national economy and, more importantly, changes the concept of product quality itself.

In contrast to the former view, the issue is not just the absence of defective products and the manufacture of goods in strict accordance with technical documentation. Primarily it involves the assurance of quality during the development stage, underscored by economic and organizational measures.

The program outlined by the resolution is based on the fact that quality is designed in during the scientific research and development stages. Any neglect in this area leads to a reduction in the product technical standard and a lowering of the prestige of engineering work. Developers have their own set of imperfections and a fear of bold technical solutions. Unfortunately, until now those at the helm of technological progress have placed very little significance on this side of things.

The developers' base of materials has also been inadequate. We know that the laboratory and testing equipment, as well as the computer equipment for design automation, available to experimental design organizations in the industrial branches is totally unsatisfactory. Specialists in these organizations do not have access to modern methods for strength estimates, or to methods for

assuring product reliability and durability. The greater part of scientific research institute and design organization material assets is allocated to worker salaries as a rule.

The resolution requires a radical reshaping of the attitude toward the development stage.

Developers are made fully responsible for the implementation of promising requirements in the areas of technological standards and quality (including product reliability and service life).

Consideration is made for the need to forecast technological standard indicators which consider international norms in order to assure competitiveness, for the development of fundamental and applied research in the fields of quality and reliability, for the development and implementation of modern estimation, design and modeling methods and for the creation of testing, diagnostic and measurement equipment, etc. This brings into action all the technological tools available for design work.

Scientific research and design work have a special role to play in assuring a critical indicator such as reliability. The method of design development accepted today is based on an evolutionary course toward assuring reliability over a period of five to seven years. The main goal is to move products into application. As the chart in the illustration shows, the reliability curve rises smoothly through the manufacture and series production stages without ever achieving high values. Such values cannot be achieved. Reliability cannot grow if it is not incorporated as a design is being developed. Only the use of the latest technical achievements and careful design development during the pre-production stage can produce good results.

Prior experience shows us that it is technically difficult and economically unjustifiable to refine a design at the end of the creation process. Breaking this poor practice requires first of all decision by the party and the government to redistribute the resources available for the development of the machine building industry. The greater the investment in scientific research and design work, the better the laboratory equipment, test stands and similar furnishings available to these latter and the better the impact to be expected from new technologies.

For example, the reliability of our aviation technology is well known. It is achieved by the fact that 85 percent of the knowledge about a new design is obtained by testing on the ground while only 15 percent comes from flight testing.

A comparatively large amount of technical standards documentation has been developed in the area of quality at the present time (see the illustration). However, the most striking characteristics here are the lack of any systematic organization in these standards and the low degree to which existing standards are used. (The illustration shows the areas in which standards have been developed for reliability assurance. The empty boxes indicate an absence of technical standards documentation in an area while the semi-shaded boxes indicate the existence of some documentation.) The state standards have

incorporated a great number of methodological regulations and they are too "ultra-scientific" for practical use.

This group of standards quite clearly illustrates the errors made by many developers of technical standards documentation. The documents contain complex analytical relationships rather than clear and precise rules, derived from scientific research, and accepted engineering practices whose implementation should result in labor and time savings during production. The practicing engineer has neither the time nor the training to master these standards. Therefore, the standards accomplish just the opposite of what they set out to do: they complicate rather than simplify.

A committee has been assigned the task of bringing order to the system of reliability standards and to develop standards documentation that will become an effective means of providing a 1.5- to 2-fold increase in the reliability of new equipment as compared to similar products manufactured at the present time.

The important role of standards in the process of fundamentally increasing the quality of the machine building industry's output must be emphasized.

We cannot fail to note that the previous orientation toward quantity in the national economy often led to a loss of the mobilizing effect of standards. The resolution contains a serious reproach direct toward Gosstandart. It has been demonstrated that the standards developed so far do not satisfy the worldwide level of technology, international standards and future scientific and technological achievements.

The practice of requiring repeated consensus to approve new standards often led to suppression of any advanced or progressive content they may have had as technology indicators were lowered to favor the branches which supplied the materials and components involved. However, even the demands of these far from ideal standards were often violated in practice.

Among the measures intended to fundamentally increase product quality, the party and government are proposing a call for the need to accelerate the review of current standards and the for incorporation in new standards of only those indicators which satisfy the highest worldwide level of technology.

In carrying out this work Gosstandart must actively influence the level of product technology and quality, and it must establish strict control over compliance with standards in effect.

The issue of quality in the materials and components needed to assure the reliability and economy indicators for machines, equipment and tools is a very critical one which has been especially emphasized in the "Measures to Fundamentally Increase Product Quality" as it gives the machine building industry priority in the areas of resources and raw materials.

Until now, the development of a product and its components began at a single starting line. The decision on materials and components was made simultaneously with the start of production. But this is not right because, as a rule, the total volume of components produced is greater than that of the final product. For example, 100 thousand automobiles require a minimum of 500 thousand tires,

a million rubber seals, etc. As a result, the supplier branches are virtually programmed to be behind from the start. Under this system they don't have the time to gear up for production or to stockpile scientific and technological resources. This is why it was no accident that component quality became the primary factor which limited the final product's reliability.

It is worth recalling that the 1970 resolution of the CPSU Central Committee and the government, entitled "Increasing the Role of Standards in the Improvement of Product Output Quality", obligated the ministries and departments to take on a leading role in the standardization of raw materials and components destined for the tools and instruments whose quality exercised a decisive effect on the technical and economic characteristics, reliability and durability of machines, instruments, automation resources and other industrial products, as well as consumer goods. This important directive was forgotten by many.

The "Measures to Fundamentally Increase Product Quality" establishes the right to set up assignments which bind the developers of materials and components to level of technology, service life, reliability and quality requirements for their products, as well as to requirements for the type, volume and methods of testing. All of this must be accomplished at the earliest possible stage of work.

At this time Gosstandart is taking measures to improve the system of interaction with the branches developing technologies and with the supplier branches during the planning and development of standards.

It is past time to make the standardization of raw materials, supplies and components a rule in the development of production norms in the metallurgy, chemical, petrochemical and other industries which supply the needs of machine building.

Machine tool building, the electrical equipment industry, microelectronics, computers, instrument making and the entire information industry are receiving priority development during the 12th Five-Year Plan. As stated at the 27th CPSU Congress, these are the long-term acceleration catalysts for scientific and technical progress. As worldwide experience shows, however, there is much work to be done on standardization and unification in order for these branches to develop.

Right now standardization programs are being developed for flexible manufacturing systems, robotized complexes and computers, etc. The task is one of implementing these programs on time and not allowing them to be emasculated.

A main focus of attention must be the development of standard interfaces and programmed methodology packages to interconnect elements in a system and the creation of language, program, device and mechanical compatibility. Together with these standards there must be a multiple order of magnitude increase in the reliability requirements for all components making up automated and computerized systems.

This is only one of the questions which must be answered by machine building standards during this five-year plan.

No less serious are the problems of reducing metal consumption and energy requirements and increasing machine and equipment productivity, which in the words of the 8 August 1986 CPSU Central Committee meeting, "must bring completely new technologies and advanced equipment to the machine building branch and provide long-lasting dynamism in its development."

Right now, industry faces the task of accelerating the introduction of new equipment by 3- to 4-fold. The road from assignment to design to factory output must be cut to a minimum. The creation of efficient system of parallel action on the part of all participants in the production process at all stages of the product life cycle calls for interbranch and branch systems of general technical and organizational (as well as process) standards.

For many years the actions of systems such as the System for Developing Products and Implementing Product Manufacture, YeSKD [Unified System of Design Documentation], YeSTD [Unified System of Technological Documentation] and a number of others have been filled with unnecessary subsystems, become overly complex and have developed into surplus means of regulating the activities of designers, production engineers and other participants in the production process. Examinations carried out by state regulatory agencies have indicated that 60-70 percent of the interbranch standards are violated during design and production work at this time. This means that these document are not working as they should and that they are being bypassed in practice.

Correcting this situation requires the examination and simplification of most of the interbranch systems and the removal of common areas and deliberate statutes from their "parenthetical" locations. To borrow the concept of the "black box" from cybernetics, we must consider production to be a "black box" and standards can only regulate the box's inputs and outputs while granting full creative freedom to the designer and production engineer.

Work on the simplification and logical reduction of systems is now very actively underway in accordance with the USSR Council of Ministers' Resolution No. 65 of 14 January 1986. It must be fully completed this year.

However, when eliminating superfluous documentation we must not forget that the release of creative energies is included in unification and standardization. Our job is not to hinder the designer but to free up his time.

The "Measures to Fundamentally Increase Product Quality" places special importance on Gosstandart's regulatory functions.

As we know, to fundamentally increase product quality, establish the acceptance of finished products and monitor the activities of associations and enterprises in the area of quality, the CPSU Central Committee and the USSR Council of Ministers have found it necessary to create a special extradepartmental monitoring authority subordinate to Gosstandart--the state inspection. It must be noted that the goal of this new committee function is the adoption, in concert with the various branches of industry, of measures needed to halt the production of low-quality goods.

In the initial stages, the state inspection will be established in more than 1400 enterprises which produce the most important products destined for the national economy and for consumer use, as well as the basic components and materials which go into these products. Most of these enterprises belong to the branches involved in machine building.

A great deal of work is now underway to formulate the inspections and to select and place highly competent and demanding specialists. This period is extremely important for all future work. No less important is the work going on, especially in the machine building enterprises, to train all enterprise departments as well as inspection personnel.

An early experiment involving the introduction of inspections in some enterprises, including ones that are quite distinguished, indicated that the inspections immediately uncovered major quality shortcomings in metal-cutting machines, agricultural machinery, picture tubes and other types of products. This lesson must be studied by all managers at enterprises which will have state inspections.

It is critical that a review of technical documentation, production processes and the activities of the technical monitoring, standardization and metrology services take place.

All possible testing facilities must be made available for the state inspection. There can be no objective evaluation of product quality without acceptance, periodic and type testing.

The main task of the inspections must be to work together with enterprise management and all design, engineering, production and monitoring services to assure the production of defect-free, reliable products.

We cannot forget that only a few months remain until the 1 January 1987 deadline for establishing inspections at the enterprises.

The "Measures to Fundamentally Improve Product Quality" resolution adopted by the CPSU Central Committee and the USSR Council of Ministers has given machine builders a reliable tool for solving the questions involved in this issue. By following the resolution's concepts and making maximum use of new standards, the consolidated standardization programs, product certification, and the implementation of the state testing, regulatory and inspection system, the entire production preparation process must make a breakthrough and fundamentally restructure machine building in order to produce machines, equipment and tools in accordance with the world's highest technology level.

[Key to illustration on previous page]

1 FUNDAMENTAL AREAS OF MACHINE BUILDING PRODUCT RELIABILITY IMPROVEMENT

2 METAL USAGE
3 years
4 PRODUCTIVITY
5 Relative level
6 ENERGY CONSUMPTION
7 Expenditures
8 For production
9 For utilization
10 Reliability level
11 Economic level of reliability
12 RELIABILITY
13 Assuring a given level of reliability prior to the start of series production.

Modeling and bench testing, reproducing normal operating conditions and extreme external influences.
14 Relative level
15 Reliability standards
16 Design work
17 Program implementation
18 Current practice
19 Start of testing
20 Time to assure standards
21 INCORPORATED DURING DESIGN
22 TECHNICAL STANDARDS DOCUMENTATION
23 Automated design system introduction
24 Use of patents and inventions
25 Analysis of similar products
26 Establishment of kinematic plans
27 Establishment of size and limit tolerances
28 Evaluation of operating conditions
29 Establishment of strength and resistance reserves
30 Establishment of component reliability requirements
31 Selection of materials and component parts
32 Establishment of failure criteria and limit conditions
33 Establishment of types of redundancy
34 Introduction of microprocessors in the design
35 Introduction of automatic failure correction
36 Use of modular design principles
37 Establishment of dimensional and functional interchangeability
38 Product unification
39 Establishment of type and feature lines
40 Development of design documentation
41 Modeling and layout
42 Accelerated testing
43 Testing with reproduction of operating conditions
44 Finishing work per test results
45 Evaluation of economy
46 Development of reliability assurance program
47 Use of advanced labor and productivity organizational methods
48 Production process automation
49 Introduction of flexible manufacturing systems
50 Introduction of automated control systems
51 Production specialization and cooperation
52 INCORPORATED DURING MANUFACTURE
53 Manufacturing process improvement
54 Introduction of strengthening processes
55 Manufacturing process typing
56 Manufacturing process precision and stability monitoring
57 100% input monitoring
58 Automation of control testing 59
Introduction of non-destructive monitoring
60 Control testing with modeling of operating conditions
61 Accelerated control testing
62 Refinements during testing
63 Process run and test run
64 Assurance of production discipline
65 Workstation certification
66 Assurance of industrial purity
67 Observance of final product preservation and packaging rules

68 SUPPORTED AND CONFIRMED DURING OPERATION
69 Unit and system status monitoring
70 Operational value monitoring
71 Technical diagnostics
72 Non-destructive monitoring
73 Introduction of industrial repair methods
74 Regular technical servicing
75 Introduction of repairs on actual demand
76 Introduction of in-house repair
77 Improvement of repair and operating documentation
78 Renewal of wear parts
79 Improvement of spare part quality
80 Observation of operating rules and conditions
81 Analysis of failure causes
82 Collection and analysis of reliability information
83 Training of servicing personnel
84 Equipment modernization

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MINISTER PANICHEV ON FMS ROLE, INDUSTRY GOALS, PROBLEMS

Moscow TEKHNIKA I NAUKA in Russian No 12, Dec 86 pp 2-6

[Article by N. A. Panichev under the heading "Branch and Science": "USSR Machine-Building--Cutting Edge of Technical Progress"]

[Text] The 27th CPSU Congress pointed out the necessity of intensifying retooling the national economy and the key role of machine-building in the profound transformations of industrial production. An important place in resolving these very important tasks is given to machine-building, to using the latest achievements of scientific-technical progress in this branch. Nikolay Aleksandrovich PANICHEV, the Minister of Machine Tool and Tool Building Industry, told our correspondent, A. Kamionskiy, about the problems being solved in the post-congress period.

Machine-building is being given a key role in accelerating the country's socio-economic development and in implementing the program for renovating the national economy in particular.

Enormous capital investment is to be directed into production renovation and retooling this five-year plan, considerably more than over the preceding 10 years.

Machine-tool and tool-building industry plays a special role in accelerating scientific-technical progress in the machine-building complex. Developing and modernizing machine-building on a new technical base depends on the technical level and production potential of machine-tool and tool-building industry. After all, the production and technical potential of machine-building lies foremost with the machinery available. Approximately 50-60 percent of the active portion of machine-building industrial-production assets is machinery, machine tools and tools.

The CPSU Central Committee and USSR government attach particular importance to ensuring outstripping development of tool-building, to qualitative growth in its technical level. This is reflected concretely in the planned rates of branch growth, in substantial change in structural and investment policy.

Our branch plans in the 12th Five-Year Plan anticipate higher rates of production growth as compared with the machine-building complex as a whole.

Machine-building and metalworking output is to be increased by 40-45 percent (average annual growth--seven percent); for our branch--57 percent (average annual growth--nine percent). Higher assignments have been set for labor productivity growth as well.

The ultimate goal of our branch is to develop in machine-building a mobile, highly automated stock of basic technological equipment which will enable us to ensure the planned machine-building production volume by the year 2000 while keeping the demand for labor resources at the 1985 level, and while also stabilizing fleet size. The equipment fleet will be shaped along the lines of significantly increasing the proportion of highly-productive automated equipment.

A reduction in the release of multipurpose machine tools with manual controls and significant expansion of the production of progressive equipment is being planned this five-year period to implement the structural policy outlined. In particular, the production of NPC machine tools is to be doubled; six times as many machining centers, 2.7 times as many flexible manufacturing modules, 3.3 times as many numerical programmed-control forge and press units and 1.7 times as many automatic machine-tool lines are to be produced.

The amounts of this and other automated equipment to be received will subsequently increase in a planned manner. This will enable us to accelerate updating the active portion of the fixed machine-building production assets to a level of 10-12 percent annually.

Along with significant development of NPC machines and machine tools, their products list will also be broadened, especially for new-generation machine tools such as flexible manufacturing modules, which are 3-4 times as productive as multipurpose machine tools. Programmed-control equipment will be increasingly oriented towards minimal human participation in production and towards providing an opportunity to use this equipment as part of flexible automated production systems.

It must be borne in mind that the introduction of flexible modules and systems in no way signifies a rejection of other means and methods of automating production, each of which has its own broad field of effective application.

Automation in large-series and mass-production branches will be based primarily on highly productive automatic and semiautomatic machines, unitized and specialized machine tools, automatic, semiautomatic and rotor or rotor-conveyor lines. The use of quickly-readjustable lines will be expanded.

The main line of development in raising the technical level of metalworking equipment is: continued increase in the level of automation, speeding up operating processes, concentrating a variety of technological processes at a

single workstation and reducing the number of servicing personnel. All operations connected with improving equipment reliability under all operating conditions are taking on particular currency.

In tool industry, scientific-technical progress will be associated with organizing on quite a broad scale the production of new types of tools, especially those using wear-resistant coatings, tungsten-free hard alloys, synthetic diamonds and other superhard materials. The use of tools made of high-speed steel with wear-resistant coatings is very promising, as they are more than twice as durable and their expenditure is reduced up to two-fold.

The volumes of new equipment production have been increased in the branch this past five-year period. We have set up series production of individual metalworking machine tools, machines with new automatic control systems, and robot equipment. We have developed hundreds of automatic lines and expanded the release of modern tools. At the same time, evaluating the situation objectively, is should be said that the production volumes achieved for progressive types of machine tools, machines and tools, and especially the technical level and quality of a considerable portion of the output, do not meet modern demands.

The continuing orientation towards technical parameters which have already been achieved in world practice is a substantial shortcoming in our work on raising the technical level of the new machine tools and machines we develop. The critical evaluation of the status of new equipment development provided by CPSU Central Committee General Secretary M. S. Gorbachev applies in full to our activity. It won't do to ride in the tracks of others. It was stressed at CPSU Central Committee conferences this May and August that the leaders of the machine-building ministries, associations and enterprises, the scientists and the specialists must quickly resolve a task of fundamental importance: bringing domestic machine-building to a world-leading position.

We have set each branch scientific research institute, design bureau and enterprise specific assignments on developing and mastering machine tools, machines and tools superior to the world's best analogs by the end of the current five-year plan. The branch has developed three target programs to this end--"Technical Level," "Reliability" and "Quality"--which represent a unified complex of measures calculated for the current five-year plan and for the long term, up to the year 2000.

Implementation of the programs to raise the technical level of the equipment being developed will ensure a 50- to 60-percent improvement in equipment productivity and a 20-percent improvement in equipment precision in the 12th Five-Year Plan.

High demands are being made on lowering specific equipment metals intensiveness (by 12-18 percent) and energy intensiveness (by 7-12 percent).

Over the five-year period, we are faced with creating and mastering the production of upwards of 1,450 machine tools, machines and other items with good, completely new technical parameters.

Improvement in reliability (increased trouble-free operation throughout the day) becomes problem number one when creating equipment to be operated automatically. All automated equipment now being developed must surpass present equipment 1.5- to two-fold in terms of reliability. It must be said that, until recently, designers, technologists and the production workers after them have failed to deal seriously with this problem.

Preparatory work is now being completed on switching the bulk of the enterprises over to state acceptance of finished products by Gosstandard [State Standards Committee] agencies. This will naturally increase the responsibility of all implementers. However, we are confronted with persistently developing in each worker and specialist a sense of state-oriented responsibility and professional pride in ensuring the high reliability of the equipment being produced.

Much attention is paid in the resolutions of the 27th CPSU Congress to improving investment policy as one of the main areas of intensifying the economy.

The government is allocating us considerable funds to develop production potential.

Sixty percent of all capital investment is being directed into carrying out the party resolutions on using capital investment in enterprise retooling and renovation more effectively, which is twice as much as was allocated in the 11th Five-Year Plan.

The bulk of the funds are being concentrated in retooling and renovating enterprises producing the most progressive types of equipment. We face a sharp reduction in the number of enterprises being built or expanded at any one time.

When retooling and renovating existing enterprises, we anticipate accelerating updating the active portion of production assets, to 10-12 percent annually.

Production retooling itself will permit a reduction in the number of workers employed at manual labor, obtaining a relative savings in the number of industrial-production personnel, and ensuring that the entire increment in production volume is obtained through labor productivity growth.

Broadening and deepening production specialization is being given a significant place in plans for accelerating technical progress. In particular, we face considerable work on raising the technical level of billet and other production. The use index for rolled ferrous metals will rise thanks to the introduction of new technological processes.

As before, branch scientific-technical progress will occur on a scientific basis, using the corresponding branch scientific-technical potential and enlisting the aid of the USSR Academy of Sciences, scientific organizations of other ministries, and institutions of higher education. We are setting

branch science major tasks. Our scientists must take charge of solving pressing problems, of the shape of new equipment for the distant future. Interbranch scientific-technical complexes will play an important role in this.

The goals planned will be attained upon implementation of the long-range comprehensive scientific-technical programs developed by branch institutes for raising the technical level and improving the quality and reliability of the equipment being produced, the basis of these programs being promising indicators surpassing the world level achieved.

In light of the resolutions of the 27th CPSU Congress, work is being done to bring branch science closer to production. The scientific-production associations now include a large number of institutes and organizations, which concentrate 85 percent of the total number of people working in branch science.

This five-year plan, financing for the development and mastering of new equipment is being increased by 24 percent. Considerable expansion of the construction of new engineering facilities and laboratories is anticipated.

Steps are being taken to provide scientific organizations with computer equipment and means to automate individual types of design.

Output technical level improvement tasks are being resolved with the broad involvement of the scientific-technical and production potential of CEMA member-nations.

Economic and scientific-technical cooperation among machine-builders in the USSR. CEMA member-nations and Yugoslavia have been developing broadly in recent years. Both scientific-technical cooperation and production consolidation have been developing fruitfully. Thus, for example, CEMA member-nations have mastered the production of a broad products mix of modern assembly components and items for delivery to the USSR based on technical assignments and documentation developed by institutes and enterprises of the Minstankoprom [Ministry of Machine-Tool and Tool-Building Industry].

The "Comprehensive Program of CEMA Member-Nation Scientific-Technical Progress Up To 2000" is the basis for the development of cooperation among the socialist countries. The enterprises and organizations of our ministry are participating directly in implementing two programs, "Comprehensive Automation" and "Developing and Mastering New Materials and the Technologies for Producing and Machining Them."

New forms of multilateral and bilateral cooperation will continue to be developed. Two scientific-production associations have been created jointly with the PRB [People's Republic of Bulgaria] to develop and produce machining centers, flexible manufacturing modules and systems for machining housing parts and body-of-rotation parts.

An agreement has also been signed on setting up an "interrobot" international scientific-produciton association whose basic tasks will be to conduct a unified technical policy and ensure a world technical level in the field of

developing robot equipment for subsequent extensive production based on specialization and cooperation. The creation of joint associations with CEMA member-nations continues.

While broadening and deepening scientific-technical and economic cooperation with CEMA member-nations, branch enterprises and organizations are also developing business contacts with many companies in capitalist countries. Appropriate agreements encompass the entire cycle, from joint design to manufacturing and marketing.

In connection with the universal introduction of new equipment and technology and the extensive use of electronics, microprocessor and computer equipment, the content and the actual process of training personnel have changed greatly and complex new tasks have arisen. Computer literacy is necessary both to researchers and engineering-technical personnel and to those servicing new-generation equipment. Many branch academic subdivisions are being enlisted in solving this problem.

The work is being done along many very important lines of scientific-technical progress. For example, training in such new specialties as NPC machine tool operation and trouble-shooting, programmed-control systems, and others, has been set up in the tekhnikums. Study programs have been supplemented in anticipation of studies in robot equipment complexes, flexible manufacturing systems, and principles of automated equipment and technological process design.

In the 12th Five-Year Plan, the long-range plan for training workers to service programmed-control machine tools and manipulators, modules and production systems, anticipates training upwards of 7,000 operators and trouble-shooters.

The newness, scope and complexity of the tasks ahead obligate us to solve the problem of the role and functions of our ministry in a new way. We are currently completing changing the branch over to a new two-link management system. Thirty-nine new production and nine new scientific-production associations have been created and 20 associations have been consolidated in the course of implementing the general plan. Work on perfecting the management mechanism will be continued.

The Minstankoprom is substantially restructuring its management methods with consideration of the necessity of developing economic methods of management and broadening enterprise and organization rights. A complex of measures is being implemented which will increase the role and independence of associations and enterprises, a number of which are already being switched over to operation under full cost-accounting.

In the initial year of the five-year plan, branch labor collectives have been carrying out assignments in a creative, business-like mood. The basic indicators have been achieved. However, these overall results could have been considerably better. Not all plants are using labor and material resources efficiently. Our organizations and enterprises have been slow to

switch over to series production of advanced machine tools and machinery. Branch science effectiveness is still poor. We consider the restructuring of our branch to be underway. The primary task now is to make it reflect all the factors influencing branch activity, and especially the human factor. For that reason, much work still remains to be done.

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RETOOLING PLANS, PRACTICAL IMPROVEMENTS IN GEORGIA VIEWED

Georgian Machine Building Problems

Tbilisi ZARYA VOSTOKA in Russian 27 Nov 86 p 3

/Article: "Machine Building--The Path of Reorganization"/

/Text/ The optimum functioning of the republic's machine building complex largely depends on the level of activities of Minavtoprom/Ministry of the Automotive Industry/, Minselkhozmash/Ministry of Tractor and Agricultural Machine Building/, and Minzhivmash/Ministry of Machine Building for Animal Husbandry and Fodder Production/. Some 90 primary and 151 shop trade union organizations unite almost 28,000 people in these sectors. This is a large force. However, has it always been used skillfully to solve urgent social and economic problems?

The trade union conference of Georgian of automotive and tractor and agricultural machine building workers answered this question. The person who read the report--the chairman of the republic's trade union committee M. M. Abbasov, and the speakers concentrated their main attention on problems and shortcomings. Thus, the Tbilisi Gruzselmash/Georgian Agricultural Machine Building/ Plant and the Kutaisi Motor Block Plant did not meet the plan for the ten months of this year. There was a shortfall of 800,000 rubles for last month. The Kutaisi Motor Vehicle Plant association has been chronically behind. Meanwhile its trade union committee is little interested in how production capacities are used here. Hence there is an unpleasant prognosis: this year the association will have a shortfall of several thousand engines. Production quality is also suffering--the enterprise has already paid up to one million rubles in fines.

However, the conference stated that financial losses were not the only problem. This also concerns the prestige of the plant's brand as well as of the republic as a whole and, in the final analysis, it directly affects the welfare of the workers. Delay in correcting the situation is intolerable: next year the association must switch to formal state acceptance of production.

In the area of increasing quality, much depends on introducing cost accounting--its main principle being wages according to final results and the final result is products and the money obtained from their sale. However, the trade union organizations have still not prepared data on the sectors for the mass

introduction of cost accounting and the conference established that the evidence of this was the very small number of brigades working according to this principle: In such large associations as Gruzselmash and Avtotekhobsluzhivaniye/Motor Vehicle Maintenance/, there are none at all.

The speakers made specific suggestions on introducing advanced forms of labor organization and wages, and on increasing the effectiveness of socialist competition. Problems connected with accelerating scientific and technical progress, increasing labor productivity, improving production quality, and carrying out agreed-upon deliveries were the subject of special talks. The conference emphasized that the trade unions must be concerned with providing for the construction, as specified in the current five-year plan, of sector enterprises in Khashuri, Dzhvari and Tetri-Tskaro, putting into operation more than 30 new maintenance projects, and increasing the volume of services to the population. The trade unions must also have a say in creating enlarged integrated and all-round brigades and in preparing enterprises for the switch to a two and three-shift work schedule. The head of the Georgian Communist Party Central Committee Organizational and Party Work Department, G. G. Gumbaridze, addressed the conference.

Batumi Work Schedule Changes

Tbilisi ZARYA VOSTOKA in Russian 24 Nov 86 p 2

/Article by Omar Margalitadze, First Secretary of the Batumi City Committee of the Georgian Communist Party: "Batumi is Preparing for Multi-Shift Work by Studying and Arming Themselves with the Experience of the Leningraders"/

/Text/ The 27th CPSU Congress aimed the party and the nation toward the reorganization of the economic system, providing for its switch to the path of intensifying and accelerating socioeconomic development.

"The essence of the changes," M. S. Gorbachev said in the political report to the Congress, "is in transferring the center of attention from quantitative indicators to quality and effectiveness, from intermediate--to final results, and from broadening productive capital--to its replacement..."

The discussion especially concerned the most active part of capital--machines, equipment, machine tools often stand idle or work at less than full capacity. This fact was cited: in machine building, metal-cutting machine tools are used for not much more than one shift. The country on the whole has an annual shortfall of billions of rubles of industrial production due to incomplete capacity loading.

All of this also relates totally to the industry of the city of Batumi. The shift coefficient for the group of large machine building enterprises is 1.31 in all and has remained practically unchanged for the last five years. For individual enterprises such as electrical machinery plants and shipyards, it amounts to a total of 1.03 and 1.0 respectively. Local industry enterprises also have the same low machine tool inventory loading level.

In studying the experience of the Leningrad party organization on intensifying production, the party gorkom[city committee] has paid special attention to their work on improving the use of the operating production apparatus. Moreover we are also not ignoring other ways to increase production effectiveness.

The fact is that with a growth in the capital-labor ratio for the industry of the autonomous republic as a whole and also in the city of Batumi, the capital-output ratio not only does not increase but it even has a tendency to decrease.

To improve the situation in this area, the party gorkom has planned a total program which provides for carrying out political, organizational, engineering-technical, social, and economic measures. Their goals and tasks have been brought to each labor collective, shop, sector, brigade, and worker. Progress in preparing for the switch to "extended operation" is discussed regularly at the working group meeting, and the situation at three union-subordinated enterprises has become a topic of discussion at the party gorkom buro meeting.

Switching to a multi-shift operation is not an end in itself. The main business is to increase production quality. This question was emphasized at a recent meeting of the Politburo of the CPSU Central Committee and is a component of the strategy of speeding up the party policy for the radical reorganization of the national economy. The non-departmental acceptance of production will be introduced at three of the city's enterprises next January. We understand very well that this work must be clearly tied with the transfer of enterprises not only to a multi-shift operation but, what is very important, to the principles of full cost accounting, self-financing and the ability to pay one's own way.

At each enterprise there are appropriate outlines of measures and projects which have been discussed at open party meetings of primary party organizations and which have found broad support among communists and a majority of the members of the collectives. In the near future we will consider at a party gorkom plenum the question of switching to a 2/3-shift work schedule and we will establish a citywide program to carry out this measure.

The organizational department of the party gorkom is studying the possibility of rearranging the work schedules of communists in order to strengthen party influence on the evening and night shifts.

An analysis demonstrates that there are reserves for increasing the capital-output ratio in the city's industry and they are considerable. Carrying out the measures outlined in the plan for switching to a 2/3-shift work schedule will permit freeing up 260 units of equipment. This figure includes 201 units for machine building enterprises, 19 for food industry enterprises, 11 for wood working enterprises, and 29 for local industries. At the same time the share of those working on the 1st, 2nd, and 3rd shifts will be distributed in the following proportion--54.8:39.1:6.1; this is in place of today's proportion of 60.3:33.9:5.7. The cost of the freed equipment will be 307,700 rubles. Moreover 96 units, amounting to 162,300 rubles, can be used at other enterprises.

Adding 24 new modern machines and units to the equipment park is required at the same time for the further intensification of production.

The further development and spread of the Leningrad initiative will seriously allow us to reach in the city's industry a machine shift coefficient of up to 1.6-1.8 and for equipment with numerical control and automatic lines--up to 1.9 as envisioned by the "Basic Directions in the Economic and Social Development of the USSR for 1986-1990 and for the Period up to the Year 2000" which were approved by the 27th CPSU Congress.

Preparatory work on switching the industry of the city to a 2/3-shift work schedule is now in full swing and will be completed by the end of the year. However, some of the most highly productive equipment--machine tools with numerical control, automatic lines and manipulators, as well as shops and sectors which are the "narrow link" of production--are already transferring to this schedule.

Thus, an additional four machine tools with numerical control at the machine building plant were switched to a 2-shift work schedule in November. This was done somewhat earlier at the electrical machinery plant. They are now transferring the machine shop here, which is limiting the production capacities of the enterprise, to a two-shift operation.

In accordance with the example of the Leningraders, they are now striving to more intensively utilize the machine tool park and other equipment at the city's industrial enterprises. Production output will be sharply increased by using the new and advanced part of productive capital in 2-3 shifts. The need to construct new shops is falling off and some 2,490 square meters of production space will be freed up, 1,060 square meters of which can be used to improve living conditions and for other social needs. A large part of the capital investments which are saved will be directed toward housing construction.

The Leningrad method is valuable because it is oriented toward the accelerated replacement of the production apparatus. Calculations show that metal-processing equipment whose operation continues for a more standardized time period, as a rule, reduces production output by approximately one thousand rubles per unit, and the costs connected with its operation are 1.5-2-fold higher in comparison with the new equipment. It is considerably more difficult to obtain articles of set parameters and the percentage of defective output grows for obsolete equipment.

We intend to pay greater attention in the future to the machine tool park, its preventive maintenance, decreasing its downtimes, increasing its use of capacity, and we will once again direct the significant funds saved on capital repairs toward housing, the construction of various cultural and personal projects, shops, schools, hospitals, and children's institutions.

However, the point is not to replace one machine tool with another one, highly productive and filled with electronics. The essence of the problem is giving it a full load. This is where not only technical but also social problems arise.

Of course, working in 2-3 shifts or switching generally to a continuous cycle creates additional difficulties. Naturally, many people will work reluctantly at night and on Saturday and Sunday. However, a good half of the petroleum refiners, chemists, metallurgists, transport workers, and medical workers are on such a schedule. Laborers in other sectors of industry can also work in this way--only appropriate explanations and the creation of special work and rest benefits are necessary. We are also aiming the primary party organizations toward this. We are simultaneously recommending that the enterprise administrations jointly with the trade union committees establish the following benefits for the Leningrad method participants: a thirteenth pay with a 1.5-2.0 coefficient; provide free meals on the night shift and on days off; grant summer leave at the same time as one's wife if she works at a given enterprise.

Party organizations are directing this work and are participating most actively in developing and introducing regulations for the economic and moral motivation of people working on this schedule.

As is evident from the calculations, the main work force influx will be from the first to the second shift (this is about 600 people for the city). This will affect first of all the operation of the city transportation system. A third rush hour will be added to the morning and afternooon ones--a night one, when the second shift will be returning home. However, the rush hours themselves will become less intensive.

An analysis has shown that the main part of the second shift workers will be transported without any problems by general-use city transportation; buses on a schedule agreed upon beforehand will drive only to the individual enterprises where work will begin in the late hours.

The following problem is the most acute--children.

For pre-schoolers the intention is to increase the hours of operation at kindergartens and nurseries up to 2000 hours. In addition, as a matter of necessity, groups will be opened in some of them where children can stay around the clock.

We will introduce an extended operation up to 2000 hours at all schools. This will be done chiefly for single mothers. In the future a boarding school must be built but for the present the parents of school children, who have no place to leave children, will only work the first shift.

The situation is more complicated for night school students. Where possible, groups will be put together by work shifts; lectures, seminar and practical training will be conducted during free time from work and on days off. Naturally, if this proves difficult to do, the students will work only the first shift.

We will provide hot meals without fail for the night shift. We will introduce appropriate changes in the operation of plant clinics and dispensaries--they will begin working from 0800 to 2000 and city hospitals will be on call by microrayons for the rest of the time.

Cultural workers will also make their contribution in this field. They will arrange daytime performances and concerts for workers on the evening and night shifts.

Within the next few weeks, the ispolkom [executive committee] of the city soviet of people's deputies will solve all of the problems on work schedule coordination and approval, transportation, children's pre-school institutions, educational establishments, medical institutions, and enterprises of trade, public catering and municipal and everyday services applicable to 2-3 shift operations in accordance with enterprise requests. The problems will be solved in such a way that people will be protected, to the maximum extent, from possible inconveniences.

As was mentioned, individual shops and sectors have already started to switch to a work schedule according to the Leningraders' method. However, the main part of the industrial enterprises will switch to a multi-shift work schedule in the first quarter of 1987. In order to adapt itself to these new conditions, the social sphere will begin working by it on 1 January.

The year of the 27th party Congress has been a time of important changes for all of us. The pivotal and revolutionary nature of the decisions made by the Congress should be reinforced daily by specific deeds. The key task of the reforms going on in the country is the reorganization of the economic system. The successful completion of this work is the first task of each toiler. All of the organizational and mass political work conducted by the Batumi party gorkom has now been directed toward its solution.

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BENEFITS OF FMS, MODULAR RESETTABLE SYSTEMS DISCUSSED

Moscos TEKHNIKA I NAUKA in Russian No 12, Dec 86 pp 14-16

[Article by Doctor of Technical Sciences B. Bazrov under the heading "New Technologies": "Modular Mechanical Assembly Technology"]

[Text] Today, we are discussing an original and, all in all, very promising development by specialist in the "Technology of Gas, Petroleum and Petrochemical Machine-Building and Tool Manufacturing" department at MING [possibly: "Moscow Institute of Petroleum and Gas Machine-Building] imeni M.M. Gubkin, a development approved at a meeting of the VSNTO [All-Union Council of Scientific and Technical Societies] presidium.

Diversity: Is It Always A Blessing?

About two-fifths of all manufacturing workers are employed in machine-building and metalworking. These branches have one-fifth of the country's fixed production assets and they produce more than a quarter of its industrial output. It is therefore obvious how important radical improvement in the technical level of items being produced by the machine-building branches and reducing their labor-intensiveness are to the national economy. Successful resolution of these tasks depends in considerable measure on the level of mechanical assembly.

An analysis of the status of that area shows that, at a majority of the machine-building enterprises, thousands of engineering-technical workers are doing what are essentially exactly the same jobs, solving excactly the same problems, day after day. The reason is that all the machine-building branches manufacture a large number of items, subassemblies and parts, in particular, which are very similar in design and functional designation. Every time, at every enterprise, a huge army of engineers and technologists develops its own technological processes anew, perfecting the production of exactly the same items, machine tolls, accessories, and tooling.

The impression is created of a great deal of successful work, inasmuch as numerous technologies and much equipment appears. But they are new in name only. If the technical-economic indicators are compared, it turns out that they generally differ little from one another. Thus, the development of

mechanical assembly proceeds extensively, with endless variants which are only slight improvements on existing ones being produced instead of fundamentally new equipment and technology. New and original designs which could have a great economic impact get lost among them. The introduction of those resolutions causes great difficulties, if for no other reason than that everyone is involved with his own inventions and improvements. As a result, we see manpower, time and materials being scattered. The national economy incurs tremendous losses.

Now Can This Be Avoided?

Attempts to solve these problems just by using type designs, unitizing and standardizing production objects, technologies and means for implementing them have not yielded the expected result. The reason is that using type designs, unitizing and standardizing use the part as the classification object. But it is described by many characteristics, leading to a large number of groups, each of which includes a small number of parts. The appearance of new part often requires the creation of new groups.

On the other hand, technology today is an aggregate of auxiliary and technological steps involving the manufacture of an individual surface of a particular part. Each technologist combines these steps in his own way into operations and proposes his own sequence for performing them, which generates multivariant processes.

Standard technologies are being introduced very slowly, however. For example, they comprise only 10-15 percent of all mechanical assembly. As a consequence, the amount of nonstandard equipment and tooling increases. Thus, the number of main-group standard sizes alone has reached 1,800, which does not include machine tools for GAP [FMS: flexible manufacturing systems] and special machine tools, whose diversity does not lend itself to recording.

In order to switch over to an intensive path of development, we need first of all to organize the scientific-technical process itself. In mechanical assembly, this can be done only on the basis of a systems approach to planning and directing the development of technological processes, equipment and tooling by using the results of thorough scientific research based on a unified system of classifications.

Its role in increasing production efficiency is enormous. If the classifications of technological processes and equipment are not coordinated with one another, progressive new processes will turn out to be unsupported by the technological means available to industry. At that point, two choices remain: either reject a promising technology or continuously produce unplanned new equipment, which requires, as does all new equipment, considerably greater expenditures.

One vivid example is GAP machine tools. In the current classification of the main groups of machine tools for machining, the method of machining is the first classification criterion, dividing all machine tools into turning,

milling, drilling or some other type. Under modern technological development conditions, it is preferable to machine a part using various methods on a single machine tool. But if there is no such classification, then a new machine tool needs to be designed in each specific instance. And there are many such examples. In sum, there is no way to include GAP equipment in the current classification, and its standardization is haphazard to a considerable extent.

In other words, there is a lack of coordination in the development of technology and equipment, which slows the introduction of progressive technical resolutions.

In the final analysis, this leads to uncontrolled and unjustified diversity and increased expenditures in all three process stages of mechnical assembly: billet production, manufacturing parts and assembling the item.

MP -- Basis of A Unified Classification

Thus, in order to reduce the diversity of technological processes and devices, we need to create for them a unified classification system including all the process stages of mechanical assembly and to use that as a basis for making extensive use of standard type-sizes, unitization and standardization in the resolutions being developed.

We in the "Technology of Gas, Petroleum and Petrochemical Machine-Building and Tool Manufacturing" department at MING imeni M. M. Gubkin have conducted research aimed at developing such a system of classifications of mechanical assembly elements.

It is based on parts surfaces modules (MP), which is understood to mean the combination of surfaces intended to perform a particular autonomous function, rather that the individual surfaces, as is presently the case. After all, in order for a part to occupy a required position in a machine, for instance, it must have a set (module) of base surfaces, such as a flat surface and two openings.

Studies of a very wide variety of parts showed that they all consist of a very limited set of surfaces modules.

MP are divided into three groups based on performance functions: base, working and linking. These, in turn, are subdivided based on structure and geometry.

The MP classification developed on this basis showed that the totality of these various surfaces reduces to 26 units. The classification can be used to create a part of any new design using these MP.

The limited number of MP permits approaching setting up mechanical assembly in a new way, including the designing of parts, the development of technological processes for manufacturing blanks, parts, equipment, tooling and measuring devices, the assembly of items, and methods of organizing and managing production.

As we know, production efficiency depends on each link in the "technology - equipment - organization and management" system, since the level of development of the preceding link definitely affects the following one. Technology is that stage at which the foundation for production efficiency as a whole is laid. Perfecting mechanical assembly must begin first with perfecting the technology.

We propose a new type, modular technology, which is capable of ensuring not only improved product quality and labor productivity, but also production flexibility.

A bank of standard MP manufacturing processes developed on the basis of the latest scientific and technical achievements and improved with the passage of time must be the basis of planning modular technology.

A group of standard technological processes taking into account the MP dimensions, the material the part is made of, and surface finish quality and precision, is developed for each surfaces module.

Standard MP manufacturing processes are combined into groups based on technological generality and the generality of the shape-generating movement kinetics. An appropriate type of equipment is created for each such group. Inasmuch as the number of MP is small, the products list of technological equipment will be approximately an order of magnitude smaller than the current products list.

A technologist developing a modular process will determine what MP the part will consist of and the manufacturing sequence. He will then extract from a card index or computer memory a standard technology which already provides the appropriate equipment and tooling.

The person designing the item will "assemble" the part from the MP offered by the classification. In this regard, his creative vision in developing new items is not restricted, just as a builder is not restricted in developing the widest variety of buildings using the same brick.

However, the new technology will also require new equipment. Machine tools will have to be created to machine not individual surfaces, but combinations of surfaces, that is, surfaces modules. It is not always appropriate to develop equipment for each MP, since that would lead much shifting of blanks from one machine tool to another in the manufacturing process. But these may be instances, foremost in mass production, when that might prove to be justified. Excluding modules with complex surfaces for which machining methods and equipment have actually already been developed, the remaining MP can be broken down into 6-7 groups based on technological generality and the kinematics of the shape-generating movements. Each can be provided with a corresponding machine-tool module in the form of a multispindle, multitool machine tool which permits combining the machining of several surfaces at one time, and even the machining of several surfaces modules at one time, in a number of instances.

The limited number of technological passes made on it makes its design and control system simpler, sharply reduces the number and products list of cutting

tools needed, and permits calculating the capacity of the tool magazine quite precisely. Such a machine-tool module would combine both special and multipurpose machine tools. It can be called a special machine tool because it is designed for a narrow products mix of technological passes. On the other hand, the machine-tool module is designed to machine the exact same surfaces modules of a wide variety of parts. In that sense, it can be included among the multipurpose machine tools. For that reason, the tooling must be exceptionally flexible, which is ensured by the extensive use of multipurpose assembly and rapidly readjustable tools and accessories.

Making the machine-tool module more like a special machine tool and the fact that it is not tied to the manufacture of a specific part permits the use of highly efficient methods of machining, even for single-item and small-series production, which methods are profitable today only in large-series mass production. Even in the billet-production process stage, consideration will be given to that combination of surfaces and geometric shapes which must be finally created in the next process stage. This is economically profitable in the billet-production process stage itself and makes the subsequent process stage easier.

The production of parts based on modular technology is set up as follows. The entire products list subject to manufacture in a prescribed calendar period is broken down into groups. Each includes those parts containing MP of the same name. Blanks arrive for machining at the appropriate machine-tool module in rather large lots, even for single-item production. The exact same parts are fed in sequentially in several groups if they contain several different MP.

The technological processes, equipment and toling in the assembly process stage are built on the same modular principle. Their diversity is reduced even further, since only the base MP are activated during assembly, and there are only 14 of these.

Thus, modular technology combines the advantages of single-item, standard and group processes and permits easy technological improvement to reflect the latest achievement of science and engineering, reducing the labor intensivenes- of production preparation and widely disseminating advanced technology to all machine-building enterprises. On the other hand, the standard MP manufacturing technology provides the designer with an opportunity construct a single-item technological process for each blank, part and assembly unit with minimal labor expenditures. He thus acquires flexibility, since the MP manufacturing sequence can be changed significantly.

What Does This Do For Us and What Do We Need To Do It?

The specialists think that building a modular mechanical assembly facility would permit:

concentrating the efforts of scientific-technical workers on developing fundamentally new equipment, eliminating parallelism and duplication of effort;

introducing a fundamentally new method of designing machine-building items already provided with progressive parts manufacturing and assembly technology;

extensive introduction of standard type-sizes, standardization and utilization into planning, technological processes, equipment, accessories, tool adjustments and measuring devices at all mechanical assembly process stages;

working out and promptly adjusting the plan for developing technology, equipment and tooling, due to the fact that they are interconnected;

introducing flow-line methods into single-item, small-series and series production;

mechanizing and automating parts manufacture and assembly;

extensive enterprise specialization and consolidation;

improved product quality.

In view of the interbranch nature of modular technology, its advantages and the possibility of significantly increasing the efficiency of mechanical assembly, it would be appropriate to create an interbranch scientific-research subdivision with a pilot production facility for developing and introducing modular technology.

Inasmuch as we possess considerable scientific experience in this area, we are prepared to offer our department as such a base and to begin working in one of the machine-building branches, with subsequent circulation to other branches.

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BRIEFS

NOVOKRAMATORSK TOOL PLANT AUTOMATED--Kramatorsk (Donetsk Oblast)--At Novokramatorsk Engineering Factory a computer is working as a steelmaker. An automated industrial process control system (ASUTP) has become operational here. A program for the production of all steel grades by electroslag remelting has been entered into the computer memory. The steelmaker-computer speeds up the melting time, eliminates errors in the process flow and reduces the losses of high-strength metal. In addition, the electronic equipment helps produce billets shaped close to the finished components. This will save another 600 metric tons of metal annually. Three shifts of steelmakers have been relieved of heavy work. Novokramatorsk Engineering Factory has been implementing the program of automation of laborious processes in a plan-governed way, starting from design and finishing with the production of modern hydraulic presses, rolling mills and walking excavators. [Article: "Steelmaker-Computer"] [Text] [Moscow SELSKAYA ZHIZN in Russian 25 Jul 86 p 1] 9922

AUTOMATED GAMMA-100 SYSTEM IN PLACE--Yerevan (TASS)--Several modifications of a new generation of the automated system Gamma-100 have been introduced into production by Yerevan Research and Production Association Ani. The new small-size system weighs just 40 kilograms; it is intended for testing the reliability of all kinds of microcircuits. The system is convenient in use and in a few seconds performs operations which previously took hours. [News dispatch: "Fast and Reliable"] [Text] [Moscow SELSKAYA ZHIZN in Russian 25 Jul 86 p 1] 9922

NEW ASSEMBLY LINE FOR URAL VEHICLE--(TASS)--A new workshop is being built at Ural Automobile Factory: mechanical-assembly workshop no 1. It will include the main conveyor line, the assembly and welding workshop, the painting shop, the machine-assembly shop, cabin welding and assembly of tracked snow and swamp vehicles. In essence, this is a second birth of the factory. In a new building, where modern equipment will be installed, the main modifications of the Ural Automobile will be assembled. [Caption to TASS photo] [Text] [Moscow SELSKAYA ZHIZN in Russian 25 Jul 86 p 1] 9922

ROBOTS INTRODUCED INTO INDUSTRY--Slutsk Metalworking Association specializes in the manufacturing of harrows, automatic water bowls and other products. Daring projects are envisaged here for the 12th-Five-Year-Plan period. In order to improve the industrial culture, increase the quantity and the raise the quality of products, dozens of technological innovations will be

introduced. They include the introduction of robots into workshops. Recently, an equipment complex has become operation: It is a press with a robot. It will stamp parts of fire extinguishers. An aggregate with strip feeder is installed next to it. A new production line has thus been formed. Another press with a robot is to be launched immediately. [Dispatch by A. Romanovich: "Robotics Introduced Into Industry"] [Text] [Moscow SELSKAYA GAZETA in Russian 22 Jul 86 p 2] 9922

MODERNIZED HORIZONTAL BORING MACHINE--A modernized horizontal boring machine model 2A622-2 has been launched at Charentsavan Machine Tool Factory. Compared with the previous model, the new machine raises productivity by 10 percent. The effect was achieved by increasing the power of the main drive, expanding the range of working feeds and raising the speed of fast movements. The carrying capacity of the bed and the machine reliability have also been improved. The new product list of the machine tool factory has been increased also by another horizontal boring machine model 2N614, with a productivity raised by 40 percent compared with the preceding model. The machine tool builders plan to continue their progress. The factory is now developing an entirely new driller-miller-borer (a machining center). This is a state-of-the-art product of the modern machine tool industry. The machining center features a sixfold productivity compared with the existing machines and can be installed on unmanned production lines. [Article by A. Bagdasaryan: "New Machine Tools at Charentsavan"] [Text] [Yerevan KOMMUNIST in Russian 25 Jul 86 p 2] 9922

THERMAL DEFECTOSCOPY--A thermal wave running over a part being tested informs the quality inspector of defects hidden in the material rapidly and accurately. The new testing method, suggested by scientists and students at the Belorussian Polytechnical Institute, can be used--different from X-ray, magnetic or ultrasound defectoscopy--to test all metals and plastics. The component must be simply heated on one side, and the data fed from special equipment into the computer are used to calculate the propagation of the thermal front inside the material. At the sites where the article contains cavities, cracks or even structural nonuniformities, the propagation pattern of the heat wave is modified. Before being flashed onto the defectoscopic screen, the information is processed by a minicomputer in fractions of a second. The operator sees the actual shape of the defect and can readily identify its type by the selection of colors. An experimental batch of video testers for technical diagnostics will be manufactured before the end of 1986 at Kaliningrad Experimental Factory imeni 60th Anniversary of the USSR of the All-Union Production Association Soyuzgazavtomatika. [New Brief] [Text] [Moscow NTR: PROBLEMY I RESHENIYA in Russian No 11, 3-16 Jun 86 p 2] 9922

ROBOTS FETCH TOOLS AND COMPONENTS--Zaporozhye Special Industrial Equipment Factory has launched a batch production of robotized equipment complexes which operate according to a program, supplying parts and tools from the warehouse directly to workplaces. Before the end of the five-year-plan period the use of the new technology will free some 3000 warehouse workers

at the enterprises of the Ministry of Electrical Engineering Industry. [News brief] [Text] [Moscow NTR: PROBLEMY I RESHENIYA in Russian No 11, 3-16 Jun 86 p 2] 9922

ROTARY PRODUCTION LINES--Rotary and rotary-conveyor lines have been put into production by the Moldavian Tochlitmash Precision Casting Machinery Production Association. Parts and assemblies are processed in a circular production line, providing a comprehensive mechanization of all labor-consuming processes. The new technology has already received a high assessment. For example, the rotary-conveyor lines installed at Kurgan Farm Machinery Factory have increased the output of cast components tenfold, while reducing considerably power and raw materials consumption. [News brief] [Text] [Moscow NTR: PROBLEMY I RESHENIYA in Russian No 11, 3-16 Jun 86 p 2] 9922

4TH WEST GERMAN TOOL SHOW--In Moscow at Sokolniki, 14-24 May 1986, 250 West German firms, enterprises and organizations presented exhibits at the show "Metal Processing Industry of the Federal Republic of Germany"; this is the fourth such exhibition in the USSR. [Introduction to a news report] [Excerpt] [Moscow NTR: PROBLEMY I RESHENIYA in Russian No 11, 3-16 Jun 86 p 8] 9922

NC MACHINE TOOLS AND ROBOTS IN KAZAKHSTAN--Kazakh SSR--Industrial robots and NC machine tools are introduced at a rapid pace at Tselinogradselmash Farm Machine Production Association. Automatic lines controlled by a small number of operators have also proved their efficiency in practice. More than a hundred robots are already operational at the enterprise. All tedious and laborious operations have been delegated to the robots. New second-generation robots are being developed at the factory's design bureau, which will service the new production lines of the first workshop and reconstructed production segments. [Caption to photo by E. Shley and A. Pavskiy (TASS)] [Excerpt] [Moscow EKONOMICHESKAYA GAZETA in Russian No 30, Jul 86 p 17] 9922

ROBOTS INTRODUCED AT A MINSK FACTORY--Ahead of schedule, the automation program of the main production line at Minsk Production Association imeni V.I. Lenin has been completed. Upon recommendation of the technical assistance council, created by the factory's party organization, 46 robotic aggregates have been installed here recently, freeing more than 200 employees. The party organization is also promoting the search for reserve capacities at each workplace. Last year this general search for reserves yielded a savings of about 300,000 rubles. [Dispatch from Belorussia] [Text] [Tashkent PRAVDA VOSTOKA in Russian 16 Jul 86 p 1] 9922

ELECTROEROSION DRILL--A new technology for drilling complex-shaped and deep holes in metals has been developed by the Institute of Electronics of the Uzbek Academy of Sciences. The conventional method of making holes in metals is by mechanical drilling. This is expensive and difficult. Some operations are simply impossible. A mechanical drill cannot change the angle of drilling inside a component, but here at the laboratory of energy conversion the machine is turned on and the drill begins to work miracles.

Inside the solid blank the drill on the operator's command changes its direction at any angle and, like a wood-boring bug, can move along a spiral or drill cavities of any shape. Any machinist would say that that's impossible, and he would be right. This is impossible for a mechanical drill. In the new machine, however, the drilling bit is ... an electrode. Now, an electrician would say that that's impossible. There are two basic difficulties: first, insulating the electrode and, second, removal of metal sawdust. These two difficulties have been resolved by a team of scientists headed by A.T. Abdukarimov, candidate of technical sciences. The electroerosion machine developed by them produces holes of a small diameter, up to 600 millimeters deep. It can also be used to extract from holes pieces of broken tools without damaging the threading. [Article by Yu. Bondarenko, Uzbek News Agency (UzTAG)] [Text] [Tashkent PRAVDA VOSTOKA in Russian 16 Jul 86 p 2] 9922

PLASMATRON CUTS THICK METAL SHEETS--The plasmatron RPT-1 with gas-vortex stabilizatwion of the arc designed by the Institute of Thermal Physics, Siberian Department, USSR Academy of Sciences, and Novosibirsk State University (1 Prospekt Akademika Lavrentyeva, Novosibirsk-90, 630090) can cut thick metal sheets and perform plasma-mechanical treatment of large workpieces. The unit consists of a specially designed cathode, the working gas (air) feed assembly and the nozzle forming the high-temperature flux. The workpiece functions as the plate. [News brief] [Text] [Moscow TEKHNIKA I NAUKA in Russian No 7, Jul 86 p 34] 9922

NIIPTMASH'S COMPRESSED AIR MANIPULATOR--A new manipulator moving loads up to a quarter of a metric ton over the radius of three meters operates on compressed air. The experimental factory of Kramatorsk NIIPTMASH [Scientific Research and Design-Technological Institute of Machine Building] has begun the production of these manipulators. The first batch has been shipped to enterprises in the heavy machine industry. The equipment is called balanced manipulator. If a load is gripped off the center of gravity, a special device shifts it into a strictly horizontal position. At least 30 manipulators are to be shipped to consumers this year. [News brief] [Text] [Moscow NTR: PROBLEMY I RESHENIYA in Russian No 10, May-Jun 86 p 2] 9922

CSO: 1823/18

UDC 621.919.2

BROACHES FOR SHAPING INTERNAL TEETH

Moscow STANKI I INSTRUMENT in Russian No 2, Feb 86 pp 19-20

[Article by B.V. Yakovlev]

[Abstract] A broaching process for internal gear teeth has been developed at the Orenburg Polytechnic Institute, the broach processing simultaneously a stack of k gears and using an adapter with n holes for guidance. The broaching operation is demonstrated on a stack of $k = 3$ gears with $z = 70$ teeth each, $z_1 = 5$ teeth being broached in one pass and $n = 7$ holes being necessary in the adapter. The construction of such a broach with adapter is in plan view and elevation view drawings with essential dimensions, including provisions for internal feed of lubricant-coolant fluid. The design procedure on the basis of gear data is formulated in nine steps. The broach consists of segments interchangeable for different numbers of teeth with different moduli. Producing such a broach requires a special machine tool for grinding an involute profile with an abrasive wheel and a special fixture holding a circular segment on which two diamond cutter bits can roll without sliding for truing the wheel along the involute. Both grinding and truing operations are monitored with a goniometer or an angular template and with a tooth gauge. Figures 3.

2415/6091
CSO: 1823/196

METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

UDC 621.9.025-112.5

COMPOSITE CUTTING TOOL

Moscow MASHINOSTROYENIYE in Russian No 6, Jun 86 pp 16-18

[Article by V.N. Skvortsov, engineer]

[Abstract] The tool economy at the Krasnodar Machine Tool Manufacturing Plant improves every year, owing to effective adaptation and implementation of standard cutting methods and tool maintenance procedures. One contributing factor is innovations in the design of composite cutters which extend the capabilities of turret lathes and special machine tools. One such new cutter (USSR patent disclosure No 1,098,676) replaces tool bits built up by brazing on strips of standard shapes made of a cermet, a Ti-W-Co hard alloy, or a tungstenless hard alloy into polyhedral or round nonresharpenable cutter bits. This composite tool operates with splitting of the feed when all cutting points of the inserts lie on the same diameter in one plane perpendicular to the axis of rotation, or with splitting of the allowance when the points are shifted so as to lie on different diameters. Repositioning of any one cutting insert changes the machining diameter in either mode of operation and requires resetting of all inserts. This new cutter saves 4,000 rubles annually in production costs. An adjustable reamer (USSR patent disclosure No 1,114,502) makes it possible to adjust the machining diameter and the configuration of cutter bits without its removal from the machine tool and is thus usable for holes in steel or in cast iron with a wide range of reaming allowance. This new reamer saves 3,500 rubles annually in production costs. A rotary cutter (USSR patent disclosure No 1,060,319) for machining shafts, axles, bushings, dumbbells, and similar parts made of harder or softer materials. This new cutter saves nominally 4,300 rubles a year in production costs. There is also available now a composite feedthrough cutter with a mechanically mounted hard-alloy bit, for fine machining of nonferrous metal or alloy parts on a turret lathe. This tool saves 350 rubles annually in production costs. Figures 4.

2415/6091
CSO: 1823/246

UDC 658.52.011.56.012.3

ORGANIZATIONAL AND TECHNOLOGICAL CONTROL OF FLEXIBLE PRODUCTION SYSTEM BY USE OF MULTIVARIANT TECHNOLOGICAL PROCESSES

Moscow STANKI I INSTRUMENT in Russian No 2, Feb 86 pp 6-9

[Article by M.Kh. Blekherman, M.D. Margolin, and V.M. Chistyakov]

[Abstract] The flexibility of a production system is determined by the possibility of readily changing over from one technological process to another so as to maintain the pace of production under changing conditions. Such a changeover is achievable by operation with multivariant technological processes, variance being generated by modification of the process route so as to avoid overloading any equipment but rather equalizing the load and also by adaptation of operations to a change of blank parts or a change of tool. Setting up multivariant technological processes and corresponding preparation of a flexible production process require coordinating the interaction of three basic subsystems within the integrated control system, namely technological preparation of production, technological and organizational control of production, and centralized control of equipment. A specific technological variant is usually selected by the technological and organizational control of production equipment and labor. An analysis of technological variance in routing and in operations, typically for a machine tool with numeric program control, indicates that variants of control programs are needed when parameters of the product change and that one given set of control programs needs to be modified only when parameters of the blank parts but not parameters of the product change. The next step is identification of a control program, which requires special coding. Multivariant routing processes are set up following an analysis of branching patterns drawn in the form of acyclic networks with each vertex corresponding to a control program. Such an analysis, according to the theory of graphs, is still done manually in an algorithmic language with syntax most expediently yielding the necessary information. Such an analysis, with entry monitoring of routes and with use of the "semaphore" principle, is demonstrated on a simle flexible small-scale production system. The final step in setting up multivariant technological processes is balancing the production programs, most expediently by the method of decomposition, for planning the allocation of resources in terms of time and providing reserves to cover without overloading any accidental deviation from schedule. Figures 1; references 3: 1 Russian, 2 Western (1 in Russian translation).

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CSO: 1823/196

COOPERATION BETWEEN CZECHOSLOVAKIA, SOVIET UNION DETAILED

Moscow JOURNAL OF THE CMEA SECRETARIAT in English No 3, Jul-Sep 86 pp 20-24

[Article by Jan Zan, Holder of a Candidate Degree in Technical Sciences, Head of the Vukov Metal Industry Research Institute, Czechoslovakia]

[Text] The steady improvement of industrial robots, manifesting itself in their ever growing compliance with changing conditions of production, an ever increasing standard of microprocessor and computer based management, and a reduction in their cost of production leads to their widening use.

Robot technology is the most rapidly developing field of automation of a wide range applicability. Experience gained in the introduction and utilization of industrial robots and robotized technological complexes, suggests the need for further intensive work on their programming the application of aggregate-module constructions and the wider use of sensors. The improvement of industrial robots and the employment of new generations steadily change the technological structure and contribute to the rapid development of NC systems in the advance production, production and postproduction stages. This is due to the consistent introduction of comprehensive, overall automation and of flexible production systems.

The scientific and technological progress in computer technology, microelectronics and robot technology allows us to cope with the comprehensive automation of production as a whole, beginning with design and development and concluding with production and marketing.

The use of microelectronics in the systems of control of the means of automation, industrial robots and other production equipment made it possible to increase, using electronic computers, the flexibility and reliability of their operation, to improve the synchronization and coordination between NC production equipment, transport, loading and manipulation and automated design systems. The requisites for the full utilization of benefits derived from industrial robots have been established by their integration in automated systems for the control of technological processes and in automated design systems. Thus, new development ideas have been developed in recent years, including computer aided design and production systems, NC equipment, computer controlled automated transport and industrial robots.

The development of flexible production systems is based exclusively on module construction, from flexible production (technological) modules, to the aggregate module construction of all other means of automation (industrial robots, equipment, instrument, etc.) Flexibility and adjustability are important parameters of devices with different programming

possibilities including industrial robots.

At present, automation, if economically justified, is used not only in mass production but also in other processes requiring the adjustment of the production and assembly lines and their equipment. The majority of manufacturing processes (about 70 per cent) belong to this sphere. However, an extensive introduction of flexible systems is costly therefore rational decisions must be taken which consider all factors.

At present, flexible production systems are primarily used for the automation of the manufacture of component parts, while comprehensive automation serves flexible automation and the assembly of complex products.

It is expected that, in the next five to ten years, industrial robots will fundamentally change the mechanical assembly of component parts. Assembling capacities of industrial robots will improve, the system of sensors and other equipment will become significantly cheaper and in software programmes languages of increasing complexity will be used. The development of sensor systems for the purposes of identification, self-diagnosis and optimization will have a significant influence on the flexible automation of assembly operations and will make it possible to start work aimed at automated production.

Experience gained all over the world, in Czechoslovakia and other socialist countries as well, demonstrates that, in addition to the comprehensive automation of fully automated production, partial automation will also come into being, permitting optimum utilization of the benefits of industrial robots of the new generation, as well as of those with cyclic control and manipulators integrated into different production and transport machines and equipment.

It should be remebered that, in industrially developed countries, simple industrial robots are more often than not used, which significantly reduces average costs and permits their number to be raised.

Robotization in Czechoslovakia

The progress of robot technology has been coordinated and controlled by state authorities since the very beginning (1975). The fundamental principles of the introduction of industrial robots were laid down by R & D work determined by the national plan of scientific and technological development for 1975–80. This covered not only a basic series of industrial robots and manipulators but also their direct use in production.

The coordinated and thorough development of industrial robots and robotized technologies was realized in conformity with the ideas of robotization approved by the Czechoslovak government. Since 1981 this has been a part of the special national programme aimed at the introduction of at least 3000 industrial robots and manipulators by 1985 and 13,000 by 1990.

The Vukov Metal Industry Research Institute was designed in 1975 to be chief designer and intersectoral coordinator for the industrial robots and manipulators. Vukov was also appointed chief projecting organization and coordinator in robotization within the national plan of scientific and technological development. In 1980, industrial robots and manipulators were designated an independent branch of production. This laid the foundation for regular organization activities of the main manufacturers responsible for the development and implementation of different types of robots,

manipulators and systems of robot technology.

Robotization in Czechoslovakia has from the very beginning been enjoying the support of the Czechoslovak government. The government took regular measures in 1983, stimulating the more extensive use of industrial robots and manipulators. The identification of economic factors stimulating both manufacturers and users of industrial robots is a key condition of accelerating robotization in the economy. The necessary material, organizational, production and technical conditions were established where needed.

An effective system will be established which will be able to ensure both the full supply of robots and manipulators and engineering design and service facilities.

The production base of industrial robots and manipulators was established through the reconstruction of existing enterprises and the putting into operation of new enterprises under the Federal Ministries for General Mechanical Engineering, that of Metallurgy and Heavy Engineering and that of the Electrotechnical Industry. The central authorities try to avoid splitting up the manufacture of industrial robots among many companies and to ensure the integration of their production with that of other important machines and equipment. This is true of the production of robotized complexes in large production associations such as the Mechanical Engineering Works, the Heavy Engineering Works and of Vihorlat Snina. In the enterprises of the Federal Ministry of Fuel and Energetics the production of industrial robots and manipulators is coordinated with the existing base of complementary units and components parts. The production of elements of robot technology has been developing also at Vukov, including the design of robotized production units.

The further growth of capacities for design, servicing and undertaking activities in robotization depends to a larger extent, on the strengthening of the principle of centralized management in the relevant research, construction, engineering and project institutes and industrial enterprises. This assures a more rapid introduction of industrial robots in the different sections of the economy. By 1995 robots and manipulators will be used in engineering and in the automation of inter-operational material handling in other processes of production.

It should be noted that, while robotization of the technologies of processing, forming, casting under pressure welding and surface treatment has been successful, the robotization of assembling operations is still in an initial phase. That is why robotization in that field will develop in the near future with special care, especially as regards assembling oprations and the handling of heavy parts. Now, robotized technological complexes will be worked out with flexible, programmable, automated means of inter-operational transport and storage, which will allow in particular, the design, development, introduction and delivery of flexible production systems based on the implementation of some groups of industrial robots.

Robotized production units will be formed primarily in newly constructed enterprises or those under construction as well as in the course of the reconstruction and modernization of existing ones. This approach makes it possible to complete the automation of the technical preparation, control and planning of production simultaneously with the robotization of production itself, by the introduction of automated design systems and automated systems for the control of technological processes. This is highly important since it provides possibilities for a consistent

realization of comprehensive overall automation under the conditions of production in small and medium series.

Role of cooperation

The technological development of robotization is performed in Czechoslovakia with proper consideration for the priorities of international economic, scientific and technological cooperation between the CMEA member countries. The Comprehensive Programme of Scientific and Technological Progress of the CMEA Member Countries up to the Year 2000 serves us as a fundamental document.

In this Programme concrete joint measures are designated for the concentration of efforts and means of the CMEA member countries on fields of major importance, where accelerated development is a decisive factor for intensifying the whole economy in order to achieve the highest standards over the widest possible range of scientific and technological progress. The Programme points out that "the establishment of automated flexible production systems and their wide range implementation in the economies of the CMEA member countries will significantly increase efficiency in production and it will lead to a 1.5–2 fold reduction of costs related growth in productivity, a growth in the utilization coefficient of equipment reduction, servicing staff and the establishment of conditions for creative and attractive labour."

One field of cooperation between the CMEA member countries envisaged by the Programme is the wide-ranging comprehensive automation of sectors of the national economy, within the framework of which the role of the establishment and implementation of industrial robots is already clear.

Not only multilateral, but bilateral cooperation as well is general in particular with the Soviet Union. The establishment of the joint Czechoslovak–Soviet Design, Construction and Technological Bureau Robot in 1984 was of special importance. The development of three industrial robots has been successfully handled by this bureau and the establishment of a robotized technological complex making possible the introduction of groups of industrial robots into the processing, forming and assembling technologies has been started.

When it comes to industrial robots jointly developed on the basis of the Long-term Development Programme of Scientific, Technological and Economic Cooperation between Czechoslovakia and the Soviet Union, the most important is the universal manipulator with portal construction of the type UM-160. It can be used in connection with the processing of shafts of a weight of maximum 160 kg and for servicing several kinds of equipment.

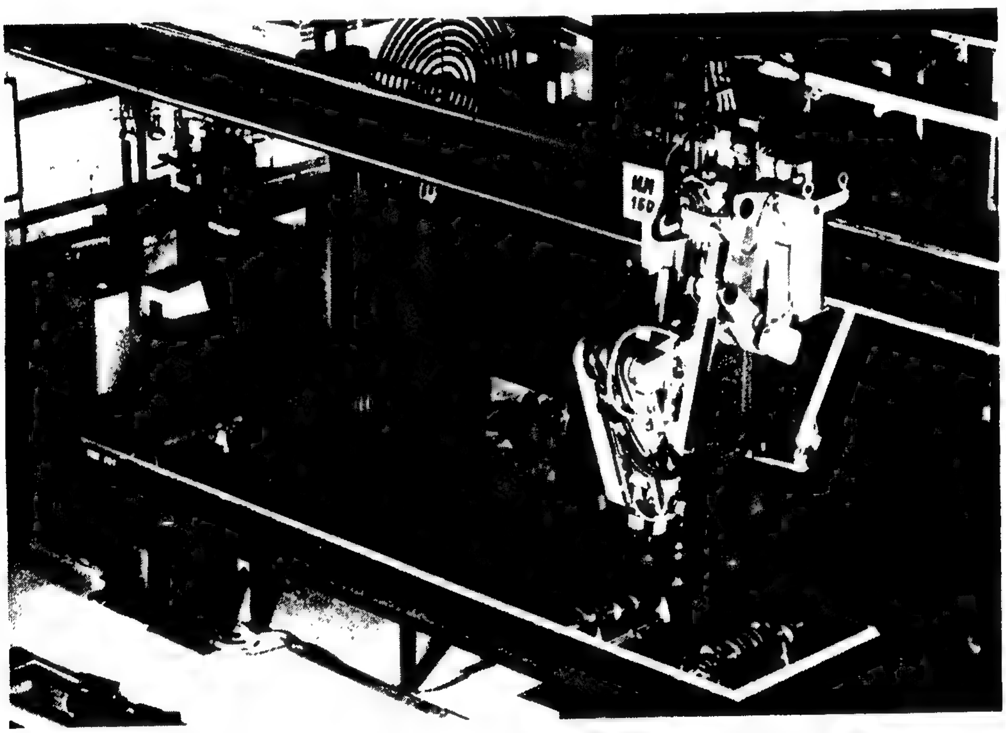
Another is the AM-5 type automatic manipulator, used for pedestal two armed shaping machines, with a loading capacity of 2.5 kg, module construction and pneumatic drive.

Finally, the special manipulator MTL-10 servicing machines casting under pressure, having a manipulation loading capacity of maximum 10 kg and hydraulic drive should be mentioned.

Participants in the development of the UM-160, beside the Vukov were: the Experimental Scientific Research Institute for Metal-cutting Machines (ENIMC, Moscow); in that of the AM-5 the Forging Equipment and Press Manufacturing Experimental Research Institute (ENIKMASH, Voronezh, Soviet Union), and in the elaboration of

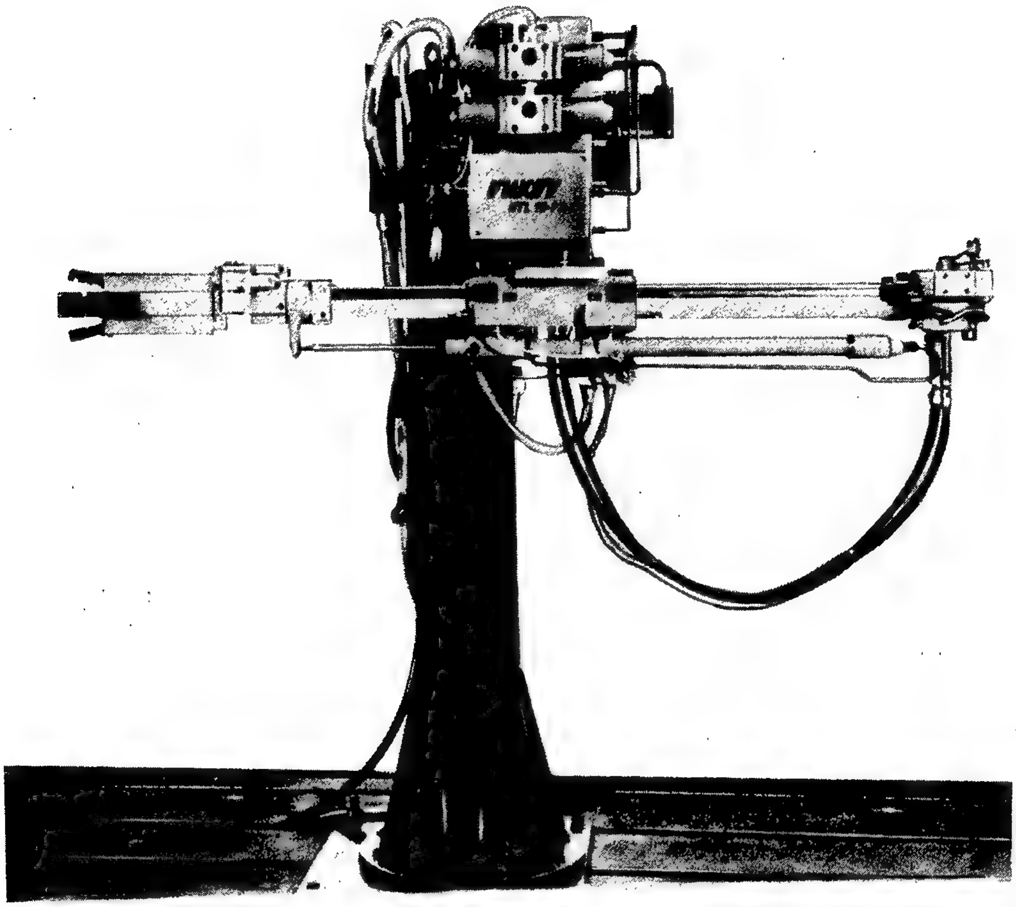
MTL-10 the Scientific Research Institute for Special Casting Methods (NIISL, Odessa, Soviet Union). The robotized technological complex based on jointly developed industrial robots is prepared by the Robot for use by the Soviet clients. Delivery of the first industrial robot to the Soviet Union was in 1985 through the Martimex Foreign Trade Company.

An important effect of wide-ranging robotization ensures the transition to the establishment and introduction of larger production groups of industrial robots. However it requires more intensive horizontal and vertical integration of production equipment and means of manipulation, transport, management, organization and labour. Large teams of engineers are needed for the establishment of such sophisticated technical complexes. A large number of interested organizations is necessary for the production of the equipment.



The UM-160 universal manipulator engaged on processing crankshafts

Photo: CMEA Archives



The MTL-10 industrial manipulator serves high pressure irrigation equipment

Photo: CMEA Archives

The Scientific and Technological Union Robot

The necessity of concentrating scientists and engineers with high qualifications as well as production and undertaking capacities and efforts aimed at a wide range technical integration and implementation of robotized complexes in various fields of production led to the establishment of the international Czechoslovak–Soviet Scientific and Technological Union Robot. The Union has the function of ensuring the realization of the Long-term Development Programme of Scientific, Economic and Technological Cooperation of both countries. Attention is focused on joint development with an appropriate division of labour in the production of experimental units and trial series and in the manufacture of equipment for robotized complexes for users in the Soviet Union and Czechoslovakia.

The Union Robot was established in compliance with the agreement concluded between the Czechoslovak and the Soviet governments in March 1985. The Union has opened up a new phase in the robotization of technological processes. The aim of the mutual cooperation, according to the agreement up to 1990 is as follows:

— preparation of a plan for the development, unification and standardization of robotized technological complexes and flexible production systems; making arrangements regarding patents;

— elaboration of type projects for flexible production systems in technologies of moulding, welding, surface treatment and assembling including inter-operational manipulation;

— production and exchange of prototypes and experimental series of means for robotized technological complexes and flexible production systems worked out in the Scientific and Technological Union Robot.

Presov, is the seat of the organization. At present the Union coordinates the activity of seven Czechoslovak and seven Soviet production and scientific research organizations. In the near future joint research, development and subsequent manufacture and delivery of five types of automated technological systems, 12 types of industrial robots and 26 variants of robotized production complexes is envisaged.

In this way the development of robot technology was given a new powerful impulse. Research & Development pays increasing attention to the requirements set by both users and manufacturers. The principles of module construction the unification and standardization of complementary units, component parts and aggregate modules are applied in the newly designed equipment, promoting the acceleration and optimization of design and production as well as the implementation and technological utilization of industrial robots, robotized technological complexes and flexible production systems. The decisions taken are equally applicable in connection with the reconstruction and modernization of existing plants and in case of new projects.

Robot does the job of coordination in the course of the whole cycle from the development of robotized technological complexes to their marketing.

The cooperating countries conclude agreements on repeated supplies as well as on specialization of production and deliveries.

Robot is a self-financing organization. It aims at and realizes the most effective solutions for the implementation of robot technology, as an intensive factor in the modernization of industrial technologies promoting the acceleration of economic and social development in both countries. The Vukov Research Institute will actively participate in the work of the organization, by carrying out major scientific research, design and planning jobs including the production of elements and complexes of robot technology.

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MACHINE SET WITH FRICTION CLUTCH AND CENTRIFUGAL ENGAGEMENT MECHANISM

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: MASHINOSTROYENIYE in Russian No 4, Apr 86 (manuscript received 15 May 85) pp 31-35

[Article by Yu.S. Korneyev, graduate student]

[Abstract] The starting performance of a machine set with a friction clutch and a centrifugal engagement mechanism for overload protection is analyzed, disregarding high-frequency speed fluctuations of the driver when the latter is an induction motor. The corresponding simplified system of first-order differential transient-state equations in torque and speed for the motor and the clutch, with the driven machine as an inertia load, is solved for zero initial conditions with all three components of the drag torque in the coupling given as functions of load and radii. A solution by the Runge-Kutta numerical method on a Nairi-2 digital computer has yielded the clutching time as well as the torque-time characteristic of the driving motor and the speed-time characteristic of the driven machine, all of which can be optimized. An experiment was performed with a special apparatus consisting of an A-31-4 motor on bearings, a clutch for testing and a counterdrive, a disk brake and a centrifugal brake, a strain gage on each, a flywheel, a mercury current pick-off, an amplifier of signals from the strain gages and the current pick-off, and a recording instrument (oscillograph). The experimental results confirm that with a clutching time of 0.05 s it is possible to attain required starting characteristics. Figures 2; references 10: all Russian.

UDC 621.941.2-229

METHOD OF INCREASING PRODUCTIVITY OF SEMIAUTOMATIC LATHE WITH NUMERIC PROGRAM CONTROL

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: MASHINOSTROYENIYE in Russian No 4, Apr 86 (manuscript received 4 Nov 85) pp 137-142

[Article by D.S. Yerokhin, graduate student]

[Abstract] The feasibility of increasing the productivity of a semiautomatic lathe with an electrohydraulic drive by reducing the radial clearance in the sleeve valve for movement of the carriage driven by a stepper motor was studied

experimentally, considering that the cyclic productivity of a lathe is theoretically $Q = 1/(t_u + t_i)$ (t_u--time of useful movements, t_i--time of idle movements) and technologically $Q = 1/t_u = v/L$ ($t_i << t_u$, L--total travel). Tests were performed with a 1P752MF3 semiautomatic lathe and a special hydraulic dynamometer, using a hydraulic pressure amplifier and a hydraulic speed reducer. The carriage displacement and velocity were measured as functions of the radial clearance in the sleeve valve and of the repetition rate of actuating pulses to the stepper motor. The load force on the carriage was measured also as a function of the radial clearance in sleeve valve and as a function of the carriage displacement. The results indicate that reducing the radial clearance from 60 um to 10 um will increase the productivity of the lathe by 40 percent under normal operating conditions. Figures 3; tables 2; references 3: all Russian.

UDC 621.867.82

STABILIZATION OF WARES BY JET ACTION DURING TRANSPORTATION BY PNEUMATIC CONVEYOR WITH AIR CUSHION

Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: MASHINOSTROYENIYE in Russian No 4, Apr 86 (manuscript received 12 May 85) pp 150-153

[Article by V.N. Kolodezhnov, candidate of technical sciences, and M.P. Shchetinin, engineer]

[Abstract] Considering that an object moving on an air cushion while being transported by a pneumatic conveyor has no inherent lateral stability and can be displaced laterally by any random perturbation so as to interfere with the conveyor operation, generating additionally lateral air cushions on both sides of the object is proposed instead of simple lateral guard plates which can damage the surface of the object or its protective coating upon mechanical contact. Such cushions are produced by forcing air from outside through holes in the guard plates on both sides of the object. By stabilizing the object laterally, these cushions will prevent contact with either of the two guard plates. The principle of this contactless stabilization mechanism is based on the theory of jet discharge through orifices against a solid body moving in the opposite direction while generally rotating about an axis perpendicular to the jet axis. Analysis and solution of the system of corresponding three equations of motion yield two conditions for stability, which may serve as basis for design of pneumatic conveyors with lateral jet action. Figures 1; references 4: all Russian.

2415/6091
CSO: 1823/226

UDC 621.9.06-529

BELORUSSIA INTRODUCING NPC MACHINE TOOLS

Moscow MASHINOSTROITEL in Russian No 12, Dec 86 pp 32-33

[Article by M. K. Moysa, engineer, under the heading "Economy, Effectiveness, Quality": "Introduction of NPC Machine Tools"]

[Text] Over the past 10-15 years, Belorussian machine-tool manufacturing enterprises have created conditions favorable to the introduction of NPC machine tools. Currently, NPC machine tools comprise 5.6 to 22.9 percent of all metal-cutting equipment in basic production, and upwards of 80 percent of it has been in operation for less than 10 years. Given growth of this kind, and with appropriate maintenance, NPC machine tools are capable of operating at peak efficiency.

The largest sectors with 50-93 percent NPC machine tools are at the Gomel Machine Tool Manufacturing Plant imeni S. M. Kirov, the Baranovichi Automatic Lines Plant and the Orsha Tool Plant. This past five-year plan, many NPC machine tools were introduced at the Baranovichi Machine Tool Accessories Plant, the Gomel Machine Tool Subassemblies Plant and the "Gidroavtomatika" PO [production association] in Gomel. There are 2.5- to eight-fold more NPC machine tools at these plants now than there were in 1980. Putting these machine tools into operation in a purposeful way, in conformity with the annual plans for introducing them, permits the advance preparation of production space, designing and manufacturing the necessary attachments (the control programs are developed when the machine tool is received), determining the amount of start-up and run-in work to be done, and, in a number of cases, training the specialists needed to start up this equipment promptly and then operate it. All machine tools received by the enterprises are incorporated into existing sectors and flow lines. Specialized start-up and run-in organizations, the manufacturers of the NPC machine tools, and the enterprises operating the machine tools all take part in the start-up and run-in work. At present, the proportion of start-up and run-in work done by the enterprises operating the NPC machine tools is dropping steadily (it is currently 52.8 percent), and the proportion of this work being done by the manufacturers of these machine tools and by the specialized start-up and run-in organizations is simultaneously increasing.

Republic machine-building enterprises have set up functional subdivisions in which each machine tool is serviced by an average of 1.04 to 1.95 people, to

facilitate the prompt incorporation of incoming equipment, maintaining it in operable condition, and organizing its effective use. The slight difference in the numbers of workers servicing NPC machine tools (hardware maintenance, repair and operation) at the different enterprises is to be explained by the specifics of the output being produced, the products mix and complexity of the parts being machined, the frequency with which various lots are produced, and the complexity of the machine tools and their control programs.

The following average basic indicators of NPC machine-tool use were achieved at republic enterprises in 1985: actual load factor Kz=0.81, shift index Ksm=1.76, multiple machine-tool servicing factor Km.o=2.00; average down time for repairs was 610.5 hours per machine tool. Down time per machine tool was significantly above average at several enterprises (Pinsk Forge-Press Automatic Lines Plant and Molodechno Machine Tool Manufacturing Plant). At the same time, many enterprises achieved positive results in using NPC machine tools and met the ministry assignments of Kz=0.85 and Ksm=1.8, among them the Minsk PO [production association] imeni October Revolution (Kz-0.87, Ksm=1.88), Minsk Automatic Lines PO imeni 60th Anniversary of Great October (Kz=0.85, Ksm=1.85) and "Krasnyy borets" machine-tool manufacturing plant in Orsha (Kz=0.9, Ksm=1.81).

This past five-year plan, 375 NPC machine tools were introduced at Belorussian machine tool manufacturing enterprises, permitting a reduction of 454,000 norm-hours in the labor intensiveness of machining parts, freeing 292 people for other jobs, and obtaining an average of 1,230 rubles in annual savings per machine tool. The introduction of NPC machine tools has also had a positive impact on such economic indicators as production cycle duration and circulating capital turnover.

Experience in using NPC machine tools demonstrates that an enterprise may have first-rate equipment and highly skilled specialists operating and servicing it, but if the products mix of parts being produced on that equipment is improperly selected, obtaining a good technical-economic impact from its introduction will be impossible.

The "Intensification" comprehensive program for the current five-year plan anticipates the introduction of more than 500 NPC machine tools at republic machine-tool manufacturing enterprises, including 58 flexible manufacturing modules and 14 flexible manufacturing systems, basically for machining housings. However, an analysis of the technological potential of the equipment being produced shows that it does not always ensure that the housings can be machined in a single operation. For example, it is hard to machine surfaces at an angle to the face of the table or the angled flutes for guide and other elements of long parts on horizontal-spindle machine tools.

There has been much discussion in the technical literature of late about equipping modules with replaceable multispindle chucks with adjustable-position spindles. However, the modules the enterprises have been receiving are not equipped with them. These and other improvements would permit an increase in production flexibility, broadening the nomenclature so as to machine parts in a more concentrated manner, and simultaneously lowering manufacturing labor intensiveness.

The technological services of enterprises and technological planning organizations are looking forward to receiving this highly productive flexible equipment, with its broad technological potential, equipment designed for the integrated machining of not only base and housing parts, but also of body-of-rotation parts, equipment designed to operate both as "unmanned" technology and as "low-paper" technology.

A few words about machine tools equipped with turret heads. With a view towards reducing the time involved in setting them up and including them in robot equipment complexes (and subsequently in flexible manufacturing systems at various levels), it is recommended that these machine tools be outfitted with replaceable multitool turret heads instead of fixed heads. This applies foremost to the 16K20F3, 16K20T1 and 16B16F3, which have a high proportion of NPC machine tools in their lathe inventories and whose turret heads are less metals-intensive than heads on other machine-tool models. As a result, the tool could be adjusted for size off the machine, using a set-up chart or reference part.

Outfitting NPC machine tools with replaceable turret heads will enable us to eliminate the optical devices now used to set up tools for size off the machines and to replace them with ordinary accessories for analogous purposes. These could be manufactured at any enterprise operating these machine tools. Inasmuch as the introduction of NPC machine tools is an enterprise assignment under the five-year plan for introducing advanced technology, automating and mechanizing production processes, and inasmuch as their production is increasing year by year, it is obviously necessary to improve both the warranty and the post-warranty maintenance and repair of these machine tools.

The Minstankoprom is taking steps to improve the effectiveness of NPC machine-tool use. This five-year plan, it intends to create a number of programmed-control metal-cutting equipment service centers, including one in Vitebsk. At the same time, it should be stressed that the effectiveness of NPC machine tools use depends largely on the equipment shift index, which is to rise to 1.9 by 1990 (2.0 to 2.5 for flexible manufacturing modules and systems) according to the control figures. However, the current procedure, under which a machine tool operating for at least 15 minutes is counted as having worked a full shift and is included in the shift-index calculation, inadequately reflects equipment use in terms of time, that is, a maximum shift index may reflect a minimal equipment load. In order to eliminate this discrepancy, it is being recommended that the shift index be in the form of a fraction representing the total number of actual machine-tool hours in a 24-hour period divided by the number of machine-tool hours the equipment available (in one shift) could be operated. This provides an opportunity to evaluate the equipment operation shift index objectively, and the funds invested in its acquisition will thus ensure an increment in production volume without an increase in the number of workers.

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TECHNOLOGY PLANNING AND MANAGEMENT AUTOMATION

UDC 658.012.011.56.011.46

KRAMATORSK AUTOMATED CONTROL SYSTEMS AND COMPUTERS COUNCIL

Moscow MASHINOSTROITEL in Russian No 12, Dec 86 p 33

[Article by V. G. Krolivets and V. D. Bogatyr, engineers, under the heading "Economy, Efficiency, Quality": "Raising the Level of ASUP in Metallurgical Machine Building"]

[Text] The Coordination-Methods Council on Automated Control Systems and Introducing Computer Equipment created at the Kramatorskiy NIIPTmash [Scientific Research and Technological Planning Institute of Machine Building] is called on to ensure a high scientific-technical level of the ASUP [plant management automation systems] being developed in metallurgical machine building and their compatibility with other systems in the main areas of coordination.

The statute on the coordination-methods council stipulates its rights and duties:

--review and prepare recommendations on long-range and current plans for creating and developing ASU at subbranch enterprises;

--discuss methods and organizational questions of developing and introducing these systems;

--approve and monitor the progress of developments being produced by enterprises and organizations enlisted both within the Mintyazhmash [Ministry for Heavy and Tractor Machine Building] and other ministries;

--coordinate, generalize and disseminate positive experience in using computer equipment and ASU.

The council basically operates through meetings held a couple of times a year in accordance with a ministry-approved plan indicating the questions to be examined, the speakers, the council meeting place and those responsible for organizing the meetings. In many instances, to prepare the questions, the council sets up special working commissions to help enterprises and check the status of the matter at hand.

The council is comprised of full-time members (representatives of the ministry's main information-computer center, production associations and enterprises, the branch institute concerned with introducing computer equipment at subbranch enterprises) and specialists invited to the meetings to review individual questions.

The council's resolutions, approved by the ministry, are binding on all production associations and enterprises.

The ASU Coordination-Methods Council maintains ties with the ASU and computer equipment section of the Mintyazhmash scientific-technical council by coordinating its work plans with it and participating in its meetings.

Initially, the work of the ASU Coordination-Methods Council was oriented towards verifying plan assignment fulfillment and progress in automating management at individual enterprises and in the subbranch as a whole, and dealt only with ASUP. In connection with the development of computer-aided design systems and plant management automation systems in recent years, the range of questions examined has come to include all elements of control automation, as well as the dissemination of leading experience in using the most effective developments in the subbranch.

After analyzing automation results over the last five years and noting the positive trends revealed in using computer equipment and automating various jobs, the coordination-methods council has outlined ways of improving the performance of the systems being developed and their influence on the end results of enterprise activity in the next five-year plan. The main directions in which control automation is to be improved are:

--the integration of local ASU at various class levels and of various functional designations into full-function, integrated ASU which is aimed at increasing control automation, effectiveness and quality, at further improving its structure, at developing the information base and broadening the functions performed by computers;

--the use of microprocessor computer equipment, mini- and microcomputers to automate the work stations of specialists which is more efficient than using large computer systems for solving many problems, thanks to the simplicity of the programming and operating language and the comparatively low production outlays;

--the use of remote data processing devices permitting controlled-channel data transmission between computers and subscribers and the more-effective use of machine time and maximum return on the subscriber's time;

--the use of sophisticated database control systems and applications program packages which permit the collection, storage and searching of data, data retrieval and editing, that is, stable operation of the base itself and the system components dependent on it.

Implementation of these resolutions will ensure a qualitative advance in the introduction of computer equipment at the enterprises and will permit the creation of conditions for switching to fully automated production controlled by modern computers.

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TECHNOLOGY PLANNING AND MANAGEMENT AUTOMATION

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NC TOOLS, AUTOMATON FIGURES FOR BELORUSSIAN, KRAMATORSK DISCUSSED

Moscow MASHINOSTROITEL in Russian No 12, Dec 86 pp 32-33

[Article by M. K. Moysa, engineer, under rubric: "Economics, Efficiency, Quality"]

[Text] Favorable conditions have been created in machine tool building enterprises in Belorussia for introducing NC machine tools. At present, the ratio of NC machine tools in basic production is 5.6 to 22.9 percent of the total pool of metal-cutting equipment with more than 80 percent in operation less than 10 years. At this age NC machine tools are capable of operating at maximum productivity with a proper servicing organization.

The largest sections equipped with 50 to 93 percent of NC machine tools are at the following plants: the Gomel Machine Tool Building Plant imeni S. M. Kirov, at the Baranovichi Automatic Lines Plant and the Orshansk Machine Tool Plant. In the past five-year plan period, NC machine tools have been introduced widely at the Baranovichi Machine Tool Fixtures Plant, the Gomel Machine Tool Units Plant and the Gomel "Gidroavtomatika" PO[Production Association]. The number of NC machine tools at these plants increased 2.5 to 8-fold as compared to 1980. A purposeful introduction into operation of these machine tools according to the existing annual plans makes it possible to prepare production areas in advance, and design and manufacture the required tooling (control programs are developed when the machine tools arrive), determine the volume of start-up and tune-up work and, in a number of cases, train proper specialists for the timely introduction and further operation of this equipment, All machine tools arriving at enterprises are introduced into existing sections and technological lines. Specialized start-up and tune-up organizations, enterprises that manufacture NC machine tools and enterprises that operate these machine tools participate in the start-up and tune-up work. At present, there is observed a constant reduction in the ratio of start-up and tune-up work (52.8 percent) done by enterprises that operate the NC machine tools and, at the same time, the ratio of work done by enterprises that manufacture these machine tools and by specialized start-up and tune-up organizations increases.

Corresponding functional subsections have been organized in machine tool building enterprises in the republic in which, on the average, one machine tool is serviced by 1.04 to 1.95 persons in order to introduce the arriving

equipment into operation, maintain it in efficient condition and organize its efficient utilization. There is some variance in the number of workers that service NC machine tools (provide software, technical servicing and operation) at various enterprises which is due to the specifics of the manufactured products, the list of products and the complexity of the machined parts, as well as the recurrence of the manufactured lots in production, the complexity of the machine tools and of their control programs.

In 1985, the following basic indicators of NC machine tool utilization were achieved, on the average, at the enterprises of the republic: actual loading coefficient Kz=0.81; shift coefficient Ksm=1.76; coefficient of multimachine tool servicing Km.o.=2.00; the average idle time in repairs per one machine tool was 610,5 machine tool hours. At several enterprises (Pinsk Forge-Press Automatic Lines and Molodechni Machine Tool plants) greater average idle time per machine tool was noted. At the same time, many enterprises achieved positive results in utilizing NC machine tools and fulfilling the ministry's tasks (Kz=0.85 and Ksm=1.8). Among them are the Minsk Machine Tool Building PO imeni October Revolution (Kz=0.87; Ksm=1.88); Minsk PO for the Manufacture of Automatic Lines imeni 60th Anniversary of the Great October (Kz=0.85; Ksm=1.85); and Orshansk "Krasnyy borets" Machine Tool Plant (Kz=0.9; Ksm=1.81).

Some 375 NC machine tools were introduced at Belorussian machine tool building enterprises in the past five-year plan period. This made it possible to reduce the labor intensiveness of machining parts by 454,000 norm hours, free 292 people conditionally and save 1230 rubles per machine tool on the average annually. The introduction of NC machine tools also has a positive effect on the level of such economic indicators as the length of the production cycle and capital turnover time.

Experience in utilizing NC machine tools indicates that it is possible to have first-class equipment and highly qualified specialists involved in its operation and servicing; however, if the list of parts machined on this equipment is improperly selected, it is impossible to obtain a high technical-economic effect from its introduction.

The comprehensive "Intensification" program for the current five-year plan period specifies the introduction of more than 500 NC machine tools at machine tool building enterprises in the republic, including 58 flexible production modules and 14 flexible production systems basically for machining housing parts. However, an analysis of the technical possibilities of the equipment being manufactured indicates that it does not always provide for machining housing parts in one setting. For example, on machine tools with a horizontal spindle, it is difficult to machine surfaces located at an angle to the surface of the table as well as angular channels for guides and other similar components in long parts.

Recently much has been said in technical literature about equipping modules with interchangeable multispindle heads with the regulated positioning of spindles. However, modules arriving at enterprises are not provided with them. The realization of these and other possibilities would make it possible to increase flexibility of production, permit more concentrated machining of a

wider product list and, at the same time, would reduce the labor intensiveness of their manufacture.

Technological services of enterprises and design technological organizations await this highly productive flexible equipment with wide technological possibilities intended for the comprehensive machining not only of base and housing parts, but also of solids of revolution parts, operating on the "unmanned" as well as on the "much less paper" technology.

We will say a few words about machine tools equipped with turret heads. In order to reduce the time for their adjustment and inclusion in robot technical complexes (and later also in flexible production systems of various levels) it is recommended that such machine tool be equipped with interchangeable multitool turret heads instead of stationary ones. This refers primarily to model 16K20F3. 16K20Ti and 16B16F3 machine tools that have a high ratio in the turning pool of NC machine tools and have less metal-consuming turret heads as compared to heads of other models of machine tools. As a result, it would be possible to adjust the tool to size outside the machine tool according to an adjustment chart or a standard part.

Equipping NC machine tools with interchangeable turret heads would make it possible to eliminate optical devices used to adjust the tool to size outside the machine tool and would replace them with the usual fixtures for similar purposes that can be manufactured by any enterprise that operates these machine tools, Since the introduction of NC machine tools is posed to enterprises as the task for the five-year plan period for introducing advanced technology,mechanization and automation of production processes, and their output increases every year, obviously, it is necessary to improve the system of technical servicing and repair of these machine tools for the guarantee and post-guarantee periods.

The Ministry of the Machine Tool and Tool Industry is taking measures to improve the efficient utilization of NC machine tools. In the current five-year plan period it is planned to create a number of technical service centers for metal-cutting NC equipment including one in Vitebsk. At the same time, it is necessary to stress the fact that efficient utilization of NC machine tools depends greatly on the shift coefficient of equipment operation which, according to control figures, must be increased to 1.9 in 1990 and for flexible production modules and systems to 2.0 to 2.5. However, in the existing situation, when a machine tool, operating for not less than 15 minutes, is considered as operating a full shift, and is included in the calculation of the shift coefficient it is reflected insufficiently in equipment utilization with respect to time, i.e.,with a maximum shift coefficient there may be minimal equipment loading. To eliminate such a discrepancy, it is recommended to define the shift coefficient as a quotient of the division of th actual total number of machine tool hours operated in a 24-hour period by the number of machine tool hours that the equipment, put in in operation (in one shift), could operate. This would make it possible to evaluate the shift coefficient of equipment operation objectively while the means invested in acquiring it would insure an increase in the volume of production without increasing the number of workers.

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Raise ASUP Standard in Machinebuilding

Moscow MASHINOSTROITEL in Russian No 12, Dec 86 p 33

[Article by V.G.Krolivets and V.D. Bogatyr, engineers: "Raise ASUP Standard in Metallurgical Machinebuilding"]

[Text] The Coordination-Methodological Council on Automated Control Systems and Introduction of Computer Techniques, created at the Kramatorsk NIIPT [Scientific Research and Design-Technological Institute of Machinebuilding].is being called upon to provide a high scientific and engineering standard of the ASUP [Automatic Enterprise Control System], being developed in metallurgical machinebuilding and their compatibility with other systems along the basic lines of interaction.

Its rights and duties are stipulated in the statute as follows:

consider and propose recommendations on future and current plans to create and develop ASU [Automatic Control Systems] at enterprises of the subsector;

discuss methodological and organizational questions of developing and introducing systems;

approve and monitor the progress of the development work done by enterprises and involved organizations of the Ministry of Heavy and Transport Machine Building, as well as other ministries;

coordinate the work, correlate and propagate positive experience of using computers and ASU.

The basic forms of the council's activity are meetings to be held once or twice annually according to the plan approved by the ministry in which are specified questions being considered, speakers, places of meetings and the organs responsible for them. In preparing questions the council, in many cases, organizes special working commissions to aid the enterprises and check the status of the work on the question being studied at the site.

The council includes permanent members (representatives of the chief computer center of the ministry, production associations, enterprises and subsector institutes involved in problems of introducing computers in subsector enterprises) and specialists invited to the meetings to consider individual questions.

The implementation of the decisions of the council, approved by the ministry is compulsory for all production associations and enterprises.

The Coordination Methodological ASU Council maintains ties with an ASU and the computer section of the Scientific and Technological Council of the Ministry of Heavy and Transport Machinebuilding Industry and coordinates work plans with it and participates in its meetings.

At first, the work of the Coordination-Methodological ASU Council was oriented toward monitoring the implementation of planned tasks and the progress of the work on automating control at individual enterprises and in the subsector as a whole and touched upon ASU only. In recent years, in connection with the development of automatic design and automatic control systems of technological processes, there were included in the area of considered questions all the components of automatic control as well as the dissemination of advanced experience in using the most efficient developments in the subsector. Having analyzed the summaries of the automation of the work in the last five-year plan period, and having identified the positive trends in utilizing computers and automating various work, the council outlined ways to raise, in the coming five-year plan period, the standards of the systems being developed and their influence on the final results of the activity of the enterprises. The basic directions to improving the work on automatic control were defined as follows:

Integrate local ASU of various class levels and functional purposes into comprehensive integrated ASU, directed toward increasing the automation, efficiency and quality of control, further improvement of its situation, development of a data base and the expansion of functions implemented by computers;

utilize microprocessors, mini- and microcomputers to automate work positions of specialists which, due to the simplicity of the programing, the operating language and the comparatively small production expenditure, appears to be more efficient in solving many problems as compared to large computer systems;

use remote data processing means which permit the control of data transmission over communications channels between users and computers and make it possible to utilize machine time more efficiently and obtain maximum yield for the users' work;

use developed systems to control data bases and applied program packets which accumulate, store and scan data, retrieve and debug it, i.e., provide stable functioning of the base itself and of the components of the system depending on it.

The realization of the adopted decisions will insure a qualitative shift in introducing computers at enterprises and will make it possible to create conditions for changing over to comprehensively automated production controlled by modern computers.

2291
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TASS: MINISTER ON MACHINE-BUILDING FOR POWER INDUSTRY

LD091250 Moscow TASS in English 1137 GMT 9 Jan 87

[Text] Moscow, 9 Jan (TASS)--The machine-building for the power industry of the USSR will produce more than 400 basically new types of technology in the next few years. These will include equipment for fast-neutron 800 MW generating units and equipment for atomic heat and power supply plants and generating units with a capacity of 1,500-2,000 MW, the minister of the industry, Vladimir Velichko, says in his replies to letters from readers of the newspaper SOTSIALISTICHESKAYA INDUSTRIYA today.

The KHARKOVSKIY Turbinny Zavod Amalgamation will produce a condensing-extraction steam turbine with a capacity of 1,070 MW which will be unique in world turbine-building.

The minister notes that export-oriented production will grow by more than 50 percent over the past five-year plan period. Under inter-governmental agreements and contracts, foreign partners have received about 30 hydropower generating units, equipment for 60 generating units of heat power stations and several generating units of different capacities atomic power stations.

The minister says that the industry is meeting all the needs of the country. About 56 percent of its output is top quality. The task is to bring to that standard 100 percent of equipment for atomic power engineering and up to 95 percent of the rest of power machinery during the current five-year period.

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